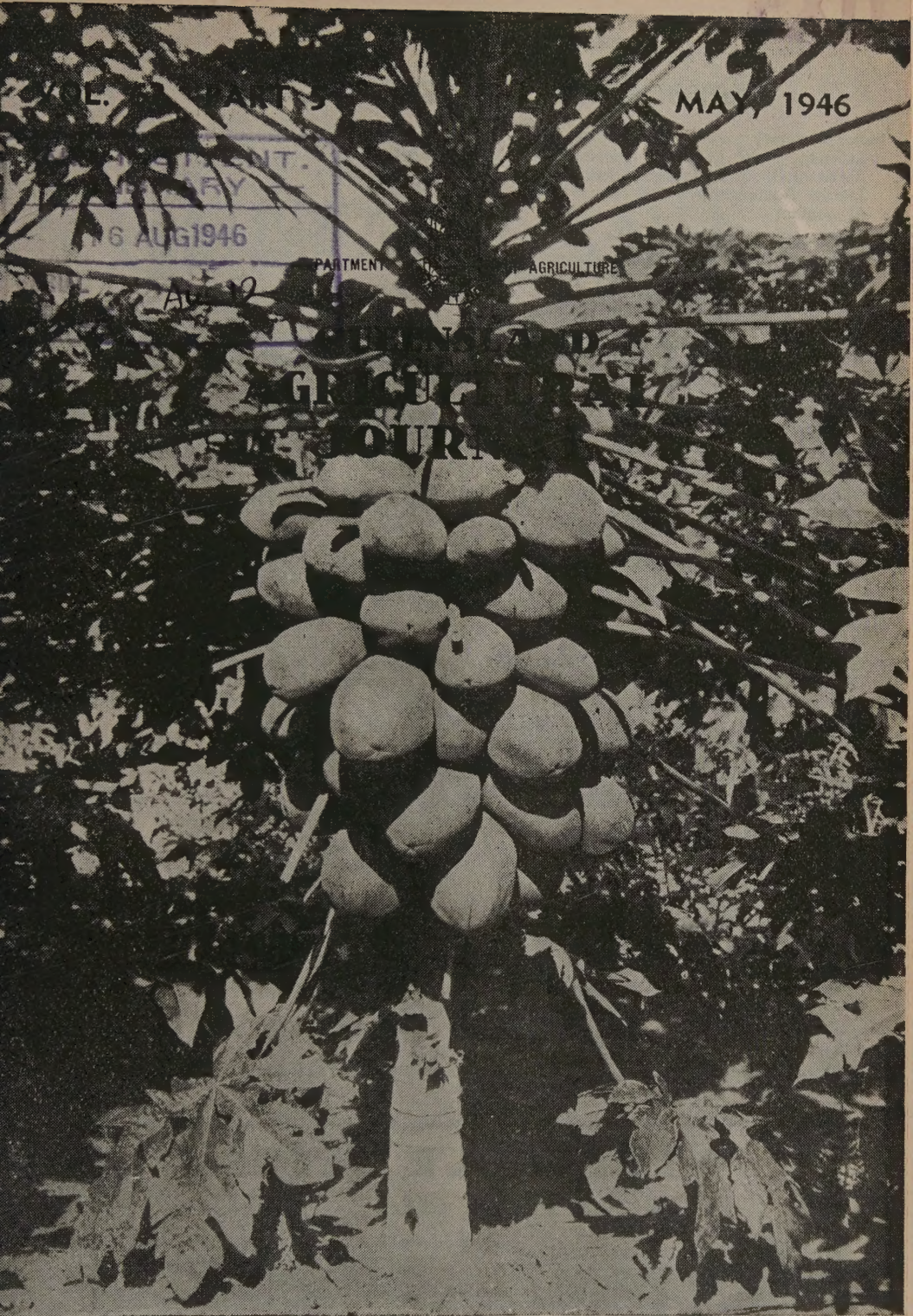
MAY, 1946



Papaw Tree in Fruit, South Coast, Q'land.

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C. W. WINDERS, B.Sc.Agr.

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Contents

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Event and Comment.

The Department and the Farmer.

IN the course of an address to the recent conference of the Queensland Farmers and Graziers' Council, the Minister for Agriculture and Stock (Hon. H. H. Collins) said that he was responsible for a department which had a body of men trained to tackle scientific problems affecting primary production, and the more the services of those officers were availed of by producers the better it would be for themselves and for the State. The Department existed solely to maintain, expand and improve agriculture, horticulture and animal husbandry and he invited the whole-hearted co-operation of producers with his officers in the solving of production problems.

Continuing, Mr. Collins said that the Government was facing the problem of land settlement and he had discussed with representatives of rural industry the number of additional settlers who could be placed successfully in various branches of primary production, but growers said that there were too many in their industries already. "Our forefathers did not accept that view, otherwise they would never have bothered about doing anything and the country would still be in its virgin state," commented Mr. Collins.

The Minister added that they had to realize that they lived in a country with an expanding population. They had to take some risk and recognize that the future would be what they made it. If they faced the future with the same courage as their boys had faced the enemy in the war, he had no fear as to the result.

Referring to price stabilization, the Minister thought they should learn from the sugar industry which, by applying the results of scientific research to the land and the mills, had increased production by fifty per

cent., and during the same period had reduced costs by half. He suggested there was scope in the dairy industry for a more scientific approach to its particular problems. For example, production per cow in Queensland was the lowest of any of the four main producing States of the Commonwealth, although Queensland had some of the richest land. In the other States climatic conditions no doubt were more suitable for introduced pasture grasses and legumes, and southern farmers therefore had the benefit of experience in pasture research in oversea countries. Queensland was not in that fortunate position, but he believed they could develop pastures which would suit their conditions and would be comparable in value with introduced pastures in other parts of Australia. The production per cow was a challenge to the dairy farmers of Queensland to survey their breeding and feeding practices and methods of management.

New Poultry Legislation.

AMONG the important new measures submitted to Parliament in the course of the recent Session was *The Poultry Industry Bill,* which was introduced by the Minister for Agriculture and Stock. In the course of his speech on the second reading of the Bill, Mr. Collins said that it was a consolidating measure under which pre-existing legislation relating to the control of the poultry industry would be repealed and new and broader principles established. To assess precisely the full value of the poultry industry to the State was not easy, for unlike other industries, its entire production was not sold through one marketing organization. Moreover, the production of household flocks throughout the State was obviously difficult to estimate. However, during the period of poultry food shortage when everyone who desired to share in the supplies available had to be registered it was possible to compute the poultry population, perhaps not quite accurately but near enough for all practical purposes. According to the closest calculation it was possible to make in the circumstances, the number of domestic fowls in the State, exclusive of ducks, turkeys, chickens and cockerels reserved for table use, approached 5 million. It was estimated that for 1945-46, commercially produced eggs in the limited controlled area would amount to 11 million dozen. The output of the industry in the uncontrolled area was assessed at 4 million dozen. Household production was not controlled in any area, but the production from this source was estimated at 5 million dozen. Thus the total egg collections approximated 20 million dozen.

The rapid expansion of the poultry industry in Queensland is shown by the fact that commercial egg production has more than doubled in the last decade. The industry last year was worth in round figures £1,900,000.

The new legislation provides for the establishment of a poultry advisory board; for the registration of stock supplies in order to control disease; a system of accredited hatcheries with the object of raising flock standards; proper certification of chicken sexers; control over the slaughtering of poultry and the licensing of premises used for that purpose; and, generally, complete control over matters affecting the poultry industry for which ample powers are contained in the measure. The Bill also provides for compensation where disease eradication necessitates the destruction of a poultry farmer's stock.

The new measure met with a favourable reception and commendation from both sides of the Legislative Assembly.

The Soil and Cultural Requirements of the Tomato.

L. G. VALLANCE, Chemist.

IN the selection of an area for tomato production, there are several important aspects to be considered. Difficulties in obtaining labour and inadequate transport and marketing facilities are factors which preclude the use of some otherwise suitable areas in outlying districts. Unsuitable climatic conditions also considerably reduce production in many districts, particularly those in which irrigation is not possible. Because of these fundamental restrictions, commercial tomato growing is tending to become an intensive and specialised industry, and areas suitable for production carry land values which are highly capitalised. The high cost of production, under such conditions, renders it necessary to maintain heavy yields of good quality fruit.

Soil Requirements.

Fortunately the tomato is fairly tolerant as far as soil conditions are concerned, and, providing weather conditions are satisfactory, it may be grown with success on a wide variety of soils. In Queensland, commercial production is carried out on both forest and scrub soils, the textures of which may vary from very sandy soils to sandy loams, loams, clayey loams or light clays. In general, the sandy loams and loams are to be preferred to those which are markedly sandy or clayey in nature. The reason for this is that the loamier soils are not so affected by the extremes of the climatic conditions, i.e. they do not become so dry in the dry weather nor so wet in the wet weather. Although excellent crops of tomatoes may often be grown on fairly heavy soils, the weather conditions must be particularly suitable. However, it very frequently occurs that these soils are either too wet or too dry to be worked into the tilth necessary for planting the fragile young tomato plant, with the result that the crop is planted too late or not at all. If a period of prolonged wet weather occurs particularly during the winter months, even a healthy, vigorously-growing crop may become a complete failure on a heavy soil which is badly drained.

Light coloured, very sandy soils should not be planted to crops which mature in the late spring or summer months as the plants will wilt badly during hot and dry conditions, unless ample irrigation is available. On the other hand, sandy soils which contain considerable amounts of organic matter, and are dark coloured and somewhat peaty in nature, are usually excellent all season tomato soils. It should be borne in mind

that sandy soils, although they may be drained fairly readily by artificial methods, are not always naturally well drained. In deep sandy areas, the ground water level may rise considerably during the wet season with a consequent waterlogging of the zone occupied by the roots of the plants. Land which shows indications of being "spewy" should be avoided unless the provision of artificial drainage is economically possible. It also frequently happens that a shallow sandy surface soil overlies a sticky yellowish clay subsoil, and, during wet weather, the porous surface soil becomes saturated with water which cannot drain away because of the impervious nature of the clayey material underneath.

Therefore, soils that are loamy and which do not show any sharp change in texture from surface to subsoil, to a depth of at least two feet, are those which are most suitable for all season tomato production. Such soils may be cultivated within a reasonable period after rain, and, because of this, weed growth is more readily controlled than on the heavier types. However, on many properties, indeed on most properties, there exists not one type of soil, but many, and these may range through all the varying degrees of texture from light sandy to heavy clay loams. It cannot be too strongly emphasised that the successful grower is the one who deals with each soil type on its own merits. He plans ahead in order to ensure that the area which is most suitable for winter planting is the one which is planted for harvesting the spring crop. If he plants in the autumn it is on land which is not subject to frost in May and June, and which will not remain excessively wet should wet weather occur during the colder months of the year.

Plate 92.

ARTIFICIAL WINDBREAK MADE OF BRUSHWOOD.

Suitability of Location and Aspect.

The ideal location of a farm for tomato growing is one with a north to north-easterly aspect, protected from heavy wind, well drained and above frost level. Although many farms have portions of their area so situated, much of the land may have a less favoured fall or be low and subject to wet conditions and early frost.

Plate 93.
An Excellent Row of Cow Cane on a Cleveland Farm.

It is necessary therefore to plan carefully taking cognizance of all the relevant factors. Thus the best aspects should be reserved for winter plantings for at this time of the year there are inevitably some adverse factors and the crop is a very valuable one. The southerly and westerly falls should be used for the early autumn plantings when growing conditions are good and the ultimate crop is removed before the cold winds and frosts appear. Often the small farm holder is forced to use low wet ground in order to practice sound rotation and such land is most valuable for a late spring crop, as the weather is usually dry for a month or two at this time of the year.

Considerable mechanical damage may be done to a tomato plant by heavy winds which also by injuring the flowers have an adverse effect upon fruit setting. Badly misshapen fruit due to faulty pollination is often the result of wind. Though many growers on the coast are well

Plate 94.
Showing Series of Cane Breaks Across Farm.

aware of the injury attributable to wind they do little to protect their crops, except at times when they preserve a small area of scrub or forest to serve as a natural windbreak. An excellent series of breaks may be made by growing rows of cow cane across the farm or on the headlands. The breaks may be planted at whatever interval is suitable for farm working, but 40 yards apart is commonly found suitable.

The cane may be pulled at the end of the season and used for feed and by the early autumn it has usually grown sufficiently high to protect the first new season's crop.

On many properties which are not affected by frost, Lady's Finger bananas prove most satisfactory for the purpose as well as providing a profitable sideline.

It is noticeable that the more compact bush types of tomato such as Rutgers, Pearson and Pritchard do not suffer from wind damage to nearly the extent as do the sprawling types such as Break o' Day and Red Marhio.

Importance of Organic Matter.

The fertility of any soil is closely linked with the amount of organic matter it contains. The decomposition of this material when acted upon by the minute organisms of the soil results in the formation of humus. Since humus has the power of absorbing many times its own weight of water, its presence in appreciable quantities results in an improvement of the drought-resisting properties of the soil. It is, therefore, highly desirable to increase the organic matter content of the lighter soils, in order to overcome the low moisture-holding capacities usually associated with these types.

Plate 95.

A YOUNG CROP OF POONA PEA WHICH RAPIDLY COVERED THE ENTIRE SOIL SURFACE AND VIRTUALLY ELIMINATED SUMMER WEED GROWTH.

On the heavier soils, organic matter in various stages of decomposition is materially effective in accelerating the downward movement of moisture with a consequent improvement in drainage. This is due to

two causes: firstly, the presence of undecomposed plant residues provides channels and openings for the movement of water; secondly, the humus, which is the final product of the decomposition, has a chemical action on the clay particles and causes the formation of small aggregates or crumbs. These crumbs do not fit closely together, but are separated by cavities or pores through which the excess moisture drains away. This type of structure imparts a mellow, friable condition to the soil, and results in the good tilth which is so often sought after by the efficient grower.

Under the sub-tropical and tropical climatic conditions which are typical of the vegetable growing areas of this State the loss of humus begins almost immediately the virgin soil is broken up. Not only does continuous cultivation accelerate this process, but at the same time such essential operations as harvesting, spraying and general maintenance pound down the soil so that a good deal of its original structure is lost. Therefore, it is essential for the tomato grower at least to maintain, if not increase, the original content of organic matter, irrespective of the type of soil he is farming.

Green Manuring.

An effective way of replenishing the soil's organic matter is to grow cover crops expressly for incorporation in the soil. Cover cropping should be regarded as having an important place in any well regulated system of farm and soil management, and is just as essential as the application of fertilizer, provision of irrigation or other necessary practices. Moreover, the continuous use of weed-smothering green manures will ultimately result in the elimination of much useless and undesirable weed growth.

Plate 96.

An Excellent Strike of Poona Pea following a Spring Crop of Tomatoes in the Redlands District.

In Plate 95 is shown a young crop of Poona pea which rapidly produced a dense cover over the entire surface of the soil. An excellent strike of Poona pea planted in late November immediately after the

completion of a spring crop of tomatoes in the Redlands district is illustrated in Plate 96. Another beneficial feature of many cover crop plants is their deep rooting habit. Their roots penetrate well below the normal cultivation depth and thus have an appreciable effect in improving the subsoil drainage.

There are a considerable number of plants which are suitable for green manuring, and the grower should select those which are known to grow satisfactorily in his particular district. It is not proposed in this article to discuss the various types of green manures in detail, and, if in doubt as to which variety or varieties to select, the tomato grower is strongly advised to communicate with this Department. A list of those which are in most common use is given below:

LEGUMES.

Summer Growing.—Cowpea (varieties Poona, groit, black, Victor), crotalarias (e.g., Gambia pea), velvet beans.

Winter growing.— New Zealand blue lupin, field peas, vetches or tares.

CEREALS.

Summer Growing.—Maize, Japanese millet, white panicum, setaria, Sudan grass.

Winter Growing.—Oats, rye, barley, wheat.

The Use of Farmyard Manure.

The value of farmyard manure for improving the fertility of soils used for tomato production is twofold. In the first place, when applied to the soil this material forms a valuable source of organic matter for conversion to humus by the soil organisms. In addition, it contains an appreciable amount of plant food materials which becomes available to the plant as decomposition takes place. The analyses of some average air-dried samples of farmyard manure are given in Table 1:

TABLE 1.

PLANT FOOD CONTENT (PER CENT.) OF FARMYARD MANURE.

Manure.	Water.	Nitrogen.	Phosphoric Acid.	Potash.
	Per cent.	Per cent.	Per cent.	Per cent.
Fowl	60	1·2	1·0	0·75
Horse	76	0·5	0·3	0·4
Cow	84	0·3	0·2	0·1

It will be seen that, although fowl manure contains more nitrogen, phosphoric and potash than either horse or cow manure, the amounts present are relatively small when compared with the recommended tomato fertilizer, which contains approximately 4·5 per cent. nitrogen, 13·5 per cent. phosphoric acid, and 6 per cent. potash. In comparison with a formula of this type fowl manure is markedly deficient in phosphoric acid and potash, and, moreover, if heavy applications are made in order to overcome these deficiencies it will be found that far too much nitrogen will be added and that unsatisfactory growth will result.

For those growers who have large quantities of fowl manure available, it is suggested that about 45 lb. of superphosphate (containing 20 per cent. phosphoric acid) be added to every 500 lb. of fowl manure.

This mixture will then be approximately equivalent to 100 lb. of a commercial mixture of the formula 4·5-13·5-6, insofar as the content of nitrogen and phosphoric acid is concerned; a further addition of approximately 4½ lb. of muriate or sulphate of potash would be required to make it equivalent in potash.

Plate 97.

A Convenient Method of Storing Farmyard Manure Gathered from the Grower's Property.—A roof or covering should be provided for protection from wet weather.

Because of the very small plant food content of horse and cow manure, the chief value of the use of those two substances is to supply organic matter for conversion to humus by the soil organisms. When broadcast and ploughed in, amounts up to 20 tons per acre are not excessive, provided they are turned into the soil some time before planting. When the manure has been heaped up and allowed to rot for several months a period of two to three weeks only is necessary between time of application and planting. Fresh manure, which is often in a lumpy condition, may require from one to three months to decompose in the soil, the period depending upon weather conditions as regards temperature and moisture. In general, it is most convenient to store the material in a heap (Plate 97) as it is gathered, and allow it to rot until required for use. In order to avoid loss of plant foods by leaching during heavy rain, it is desirable that a roof or covering of some kind should be provided.

The Use of Lime and Dolomite.

Many tomato growers are well aware of the beneficial effect obtained where materials containing lime or magnesia have been applied to certain types of soil. Some confusion exists, however, as to what actually happens when lime or dolomite (which is lime plus a certain amount of magnesia) is mixed with the soil and why this improvement occurs on some soil types and not on others. The effects produced by either of these two substances may be briefly summarised as follows:

(*a*) The correction of excessive soil acidity by neutralising soil acids;

(*b*) Altering the physical nature of the soil and producing a mellow, more friable condition;

(*c*) Providing lime and magnesia for use as plant food, since these two substances themselves are essential for plant growth.

Fortunately the tomato plant is rather tolerant as far as soil acidity is concerned, and may be grown successfully even on soils which are too strongly acid for many other crops. However, continuous cultivation, particularly under irrigation, accelerates the loss of such acid correcting substances as lime and magnesia. Furthermore, the use of acidic fertilizers such as ammonium sulphate also tends to increase acidity and after several years continuous use soil acidity may be built up to a degree which prevents the optimum growth of the plant. Such a condition may be quickly and satisfactorily corrected by an application of lime or dolomite. If a grower is in doubt as to whether his soil needs either of these two materials for the correction of acidity, a soil test is a very useful guide. This Department has the facilities for carrying out this test and the grower is urged to seek advice either directly from this office or through his district Advisory Officer.

It should always be borne in mind that, although the tomato plant can withstand fairly acid conditions, a high degree of acidity is particularly unfavourable for the growth of most green manure crops. It is also injurious to the minute soil organisms whose presence is essential for the conversion into humus of the ploughed-in residues of these plants. The presence of a high concentration of soil acids will prohibit the rotting of vegetable matter to such an extent that the value of green manure may be reduced to almost negligible proportions. This will cause a considerable decline in soil fertility, particularly on those soils which must, of necessity, be planted to cash crops in almost continuous succession. Therefore, an occasional dressing of lime or dolomite in conjunction with a green manuring programme will considerably assist in maintaining the humus content of intensively cultivated soils. With the exception of the very sandy types, soils which are deficient in humus are usually difficult to prepare and bring to the good tilth necessary for tomato culture.

In addition to their beneficial effects on the tilth of the soil by creating conditions favourable for the manufacture of humus, lime and dolomite also have a direct chemical effect on the clay particles which are present in all soils. These minute particles which occur in considerable proportion in the heavier soils become aggregated, i.e. large numbers of them join together forming small lumps or crumbs. When in this condition, the soil does not set or form large clods and the drainage is considerably improved. Soils which are "sour," i.e. those of low lying areas which remain wet and practically waterlogged for long periods, have often been reclaimed by heavy dressings of lime or dolomite, providing a system of artificial drainage is put in at the same time. This drainage, of course, is necessary to carry away the water which will be freed from the soil as a result of the improvement in physical condition. Unlike an analysis for soil acidity there is, unfortunately, no chemical tests which will indicate the necessity for lime as far as soil tilth is concerned. If a soil is not highly acid but is cloddy and difficult to work, a dressing of lime or dolomite will often create an appreciable improvement, particularly if for the next year or so green manuring is carried out in rotation with cash crops.

Lime and magnesia, as well as being soil improvers, are also, in themselves, important plant foods, and herein lies the only essential difference in the use of lime and dolomite. If a soil is deficient in magnesia, dolomite must be used since it alone contains magnesia. On the other hand, should the soil be deficient in lime, then either lime *or* dolomite could be used, since the latter contains both lime and magnesia, usually in about equal amounts. Fortunately, however, practically all Queensland soils which are suitable for tomato growing contain sufficient amounts of these two substances to supply the plants' requirements, even after being cropped for a large number of years. The amount of lime and magnesia taken up by the plant is small in relation to the actual amounts present in most soils. In general, then, the application of lime or dolomite is mainly necessary to correct soil acidity and to improve the physical condition. Since either of these materials is equally effective in these respects the question of which to use is simply a matter of which is most easily procurable, having due regard to their cost and purity.

Neutralising Value.

Lime may be purchased in several forms, all of which are suitable for agricultural purposes. Dolomite is available in one form only. The various commercial lines are as follows:

(*a*) Agricultural lime (carbonate of lime);

(*b*) Dolomite (carbonate of lime plus carbonate of magnesia);

(*c*) Burnt or quick lime (oxide of lime);

(*d*) Slaked lime (mixture of hydrated oxide and carbonate of lime).

The power of these substances to neutralise acidity is termed the "neutralising value." In order to create a standard for comparison purposes, the neutralising value of one hundred per cent. pure agricultural lime, i.e. carbonate of lime, is taken as 100. If it contains impurities, the value will be less and in order to indicate this fact to the grower the neutralising value is printed on the label attached to the bag. Supposing, for instance, a grower were able to obtain two samples of agricultural lime at the same price, one of which had a neutralising value of 90 and the other of 80, the former would be preferable, since it would take 9 tons of the latter to have the same effect as 8 tons of the higher grade lime. This same system of evaluation may be applied to dolomite, which is very similar in neutralising value to agricultural lime. Burnt or quick lime has a higher value than agricultural lime, whilst slaked lime is also higher, but slightly less than burnt lime. One ton of burnt lime with a neutralising value of 160 would be equivalent to 2 tons of agricultural lime or dolomite, with a value of 80. Therefore, if a grower has the choice of several sources of lime, or dolomite, a consideration of the neutralising value stated on the label, in conjunction with the price, will enable him to make the most economic purchase.

A further point to be considered in the purchase of lime or dolomite is its degree of fineness. Since these substances do not dissolve in water, it is necessary for them to be in a very fine powdery state for the maximum reaction to occur when mixed with the soil, and moreover, the speed at which this takes place is practically entirely dependent upon the fineness. Because the process of burning lime results in a very finely

grained product, burnt lime has a much more rapid action than agricultural lime or dolomite. Since slaked lime is simply burnt lime which has been exposed to the air, it is also very powdery and quick-acting. In general, however, agricultural lime and dolomite are ground to a satisfactory state of fineness before being placed on the market, since it is required by law that the degree of fineness be declared on the label. As a general approximation, it may be stated that burnt or slaked lime will be effective in about a month after application, while a good agricultural lime or dolomite will require from two to three months.

When considering the application of lime or dolomite to tomato soils, it is not possible, nor is it necessary, to be very specific as to the amounts to be supplied. The amounts set out in Table 2 will be found to be generally satisfactory.

TABLE 2.

SHOWING REQUIREMENT, IN TONS PER ACRE, USING GOOD QUALITY AGRICULTURAL LIME OR DOLOMITE.

Degree of Acidity.	Sandy Soils.	Loams.	Clay Loams.
	Tons per Acre.	Tons per Acre.	Tons per Acre.
Fairly acid	1	1½	2
Strongly acid	1½	2	3

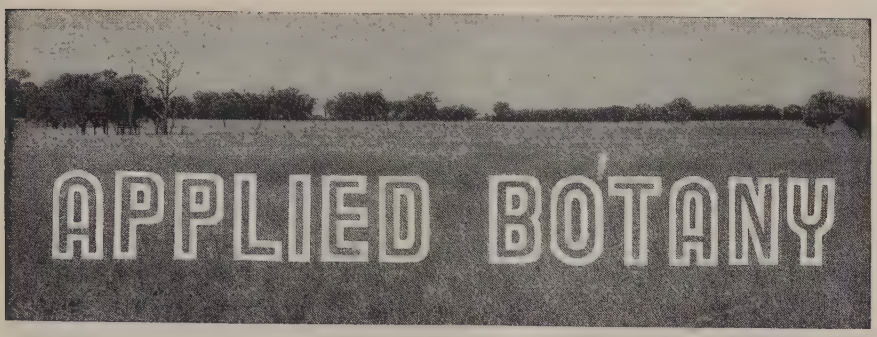
These amounts are based on the use of good quality (neutralising value approximately 100) agricultural lime or dolomite. If materials with lower values are used it would be advisable to increase the amounts proportionately. Should the grower desire to use burnt or slaked lime, in order to obtain quicker results, the rate of application per acre should be decreased according to the increased neutralising values. For instance, if the burnt or slaked lime had a neutralising value of 120 then the amounts required would be 10/12ths of the amount given in Table 2. Again, if the neutralising value were 160, it would only be necessary to use 10/16ths of the quantities shown above for agricultural lime or dolomite.

THE CASE FOR COUNTRY INDUSTRIES.

Farmers in the southern States are making a bold bid for decentralisation of industries and, as a natural corollary, decentralisation of population. In Victoria, a strong organisation known as the Victorian Decentralisation League has already put up a comprehensive case for its objectives which are largely in line with those of the New Deal for the West movement in Queensland.

Decentralisation depends, obviously, on the establishment of secondary industries in country towns, preferably industries which employ a large number of men. Many factors necessarily have to be considered in connection with such an industrial movement to inland areas. Included in those factors are transport (railway freights, accessibility, and so on); ample water and electricity supplies at reasonable rates; and provision of the amenities of modern life.

Some degree of decentralisation was forced on us during the war when important munition works were removed from what were then regarded as vulnerable places close to the coastal cities. As a result of that partial decentralisation, great impetus was given to country towns in which wartime factories were located, and that meant an increase in local population and better nearby markets for food producers. For the good of the nation at large it is felt that this movement away from the one big city should not be allowed to go too far into reverse, where it has already slowed down since the war ended. It would certainly be a great thing if wartime factories could be turned over to peacetime production in country towns.



St. Barnaby's Thistle.

C. T. WHITE, Government Botanist.

MANY farmers on the Darling Downs have become alarmed at the spread during the past two or three years of a thistle with yellow flowers and very spiny seed heads, and a number of specimens have been received at the Department for identification and report. It proved to be a weed for which the name St. Barnaby's Thistle has been proposed as the standardised English name in Australia. It has long been naturalised in the Southern States, and is perhaps best known as Yellow Cockspur, a name it shares with a closely allied plant. It is also known as Saucy Jack.

The accompanying illustration will enable farmers and pastoralists to recognise the plant should it make its appearance on their properties. It has recently been declared a noxious weed throughout the State.

Description.—A stiff branching thistle, 1-2 feet high or more, the stem and leaves clothed with white, close, rather cottony hairs; basal leaves lobed, 3-4 inches long, but only seen in the younger plants, stem leaves narrow, 1-2 inches long, continued at the base into a narrow wing running down the stem. Flower heads ("flowers") yellow, single at the ends of the branches, enclosed in a number of bracts, some of them ending in long spreading yellow spines $\frac{1}{2}$-1 inch long or even slightly more. "Seeds" light brown, shining, about an eighth of an inch long and surmounted by a white tuft of hairs slightly longer than the seed itself.

Country of Origin.—Central and Southern Europe.

Common Names.—St. Barnaby's Thistle, Yellow Cockspur, and Yellow Star Thistle. The origin of the first name, which the Council for Scientific and Industrial Research recommends as the standard local name, is that in Europe it comes into flower about midsummer, somewhere about St. Barnaby's Day, 11th June.

Properties.—It is not known to possess any poisonous or harmful properties and in its young stage is eaten by stock to some extent. It soon becomes, however, harsh and unpalatable.

Eradication.—It is an annual weed of harsh wiry growth, and hand-chipping or cutting off below the surface of the soil by any means is the most satisfactory method of eradication. Usually it is possible to deal with the plant by this method.

* *Centaurea solstitialis.*

Plate 98.

ST. BARNABY'S OR YELLOW COCKSPUR THISTLE.

ANSWERS.

(Selected from the outgoing mail of the Government Botanist.)

Sesbania Pea—Johnson Grass.

Inquirer (Proston)—

1. Sesbania Pea or Gulf Pea (*Sesbania aculeata*). This plant sometimes comes up in great abundance, particularly on rather damp land. It is not known to possess any poisonous or harmful properties at any stage of its growth. The seed might have some value as a poultry feed.
2. Specimen very immature, looks like Johnson Grass (*Sorghum halepense*). Johnson Grass is a very serious pest of cultivation because of its underground runners, which, when cut up into small pieces, are capable of forming many new plants. It is quite a good fodder, relished by stock, but like other members of the Sorghum family contains a prussic acid yielding glucoside and some care should be exercised in feeding it off. Cattle should not be allowed to gorge on it on an empty stomach.

Cobbler's Peg.

O.C. (Macalister)—

The specimen is the cobbler's peg (*Bidens pilosa*), a very common farm weed in coastal Queensland. It mostly occurs as a weed of cultivation or grows on disturbed land. It is very common in vacant town allotments and is not known to possess any poisonous or harmful properties. It is doubted if the plant will become a serious pest in the West and the seeds would be comparatively easy to treat in wool.

Plants Identified.

R.D.C. (Rockhampton)—

1. *Myoporum acuminatum*, Strychnine Bush. Feeding tests definitely showed this plant to be poisonous to stock. Constipation and bloody faeces are generally a feature of *Myoporum* poisoning.
2. *Eremophila maculata*, Fuchsia Bush. Stated that prussic acid poisoning seemed to be indicated. In that case, this bush is the most likely cause of the trouble. It contains a prussic acid yielding glucoside which at times rises very high. At other times, ordinary paddock resting stock may feed on the plant with comparative safety.
3. *Zygophyllum apiculatum*, Gallweed. Suspected as poisonous but feeding tests have always given negative results.
4. A poor specimen, but probably *Ehretia membranifolia*, a common tree in the mixed scrubs of Central Queensland. No common name for it is known.
5. *Erythroxylon australe*. This plant belongs to the same genus as the one which produces cocaine, but is not known to possess this drug nor to have any harmful properties.
6. *Terminalia oblongata*, Yellow-wood. Causes staggers in stock.
7. *Acacia* sp. It is difficult to name species from leaves only.
8. *Kochia tomentosa*, Cotton Bush. Generally regarded as a comparatively reliable fodder in times of drought.
9. *Santalum lanceolatum*, Damson or Plum-wood. A good fodder.
10. *Enchylaena tomentosa*, Barrier Saltbush. Generally regarded as a good fodder.
11. *Arundinella nepalensis*. A native grass for which no common name is known. It is very common on hillsides in forested country, but is not confined to such localities. It is rather a wiry grass and not of much value as a fodder.
12. *Leptochloa digitata*, Cane Grass. This grass contains a small amount of a prussic acid yielding glucoside but is unlikely to cause trouble.

"Deadly Nightshade."

A.V.F. (Bundaberg).

The specimen is *Solanum Seaforthianum*, commonly cultivated as a garden climber in Queensland gardens. It has run out and become naturalized as a weed in some scrub areas, and is popularly known as deadly nightshade, though it is not the same as the plant known under that name in Europe. The plant has been proved by feeding tests to be poisonous to stock.

PLANT PROTECTION

Notes on Fungicides for the Control of Tomato Foliage and Fruit Diseases.

J. E. C. ABERDEEN, Pathologist.

DURING the period 1937-1941 a number of experiments on the control of tomato diseases by fungicides were carried out by this Department, principally in the Redlands district. The results were published quarterly in the "Queensland Producer" under "Report of Tomato Pathologist," but no summary combining the results of all the trials and observations has been issued. These notes are based principally on the above experiments but also include the results of a further trial made by this Department in 1944, and one made by the Department of Agriculture, New South Wales, in 1941.

Bordeaux mixture of 4-4-40 strength is the long established treatment for the control of tomato foliage and fruit diseases. Consequently, in all the experiments, this spray has been used as the standard with which the other fungicides were compared.

The principal disease used in making these comparisons has been that which is usually known as target spot in Queensland, but often called early blight in other countries. It may have been expected that the more spectacular Irish blight would have been used, but this was not possible as that particular disease was almost entirely absent in the experimental plots. The chief reason for this absence is believed to be the relatively greater susceptibility of Irish blight fungous spores to copper fungicides in general, because it was known that this disease was active during several of the seasons in which the trials were made. Combining this observation on the experimental areas with more general ones over other districts it is considered that any of the copper fungicides used in these trials, with the possible exception of the copper carbonate spray discussed below, will effectively control Irish blight if applied regularly, i.e., every seven to ten days, and thoroughly. In the case of target spot, however, differences become apparent particularly between the dust and spray methods of application.

Home-made Spray Mixtures.

Two home-made sprays are considered worthy of mention here—the Bordeaux 4-4-40 mixture and the home-made cuprous oxide spray. The home-made cuprous oxide spray is already established as a substitute for Bordeaux on citrus. On tomatoes it was found to be quite as efficient as Bordeaux 4-4-40 in disease control, and possessed the advantage that in the large majority of the experiments the plants treated with this spray

gave much higher yields than those treated with Bordeaux. For two unpruned crops grown in spring the yields were approximately equal but for the other five trials the cuprous oxide gave increased yields of 10, 17, 22, 25 and 28 per cent. On these results, if a grower is going to mix his own spray, then home-made cuprous oxide mixture is recommended. The method of mixing this spray is not discussed here but new growers desiring such information will be supplied with it on request.

Commercial Spray Mixtures.

Two types of commercial spray mixtures are available. The first group are those containing insoluble copper compounds, i.e., cuprous oxide, copper oxychloride, basic copper sulphate, and basic copper carbonate. In contrast to bluestone (copper sulphate crystals), which dissolves completely in water and must be neutralised with hydrated lime to prevent destruction of the plant foliage, these compounds are completely insoluble in water and require no neutralising agent before being applied to the plant foliage. They all contain 50 per cent. copper. Those of the second group resemble a Burgundy mixture and contain copper sulphate, washing soda and lime. These usually contain 12½ per cent. copper.

In the Queensland trials all sprays were used at such a strength as to give an amount of copper per 40 gallons equivalent to that contained in the copper sulphate (bluestone) required to make up the same quantity of 4-4-40 Bordeaux mixture. In the first group of sprays this meant using 2 lb. per 40 gallons of water, while the second group required 8 lb. per 40 gallons.

The cuprous oxide spray was used in the greatest number of trials and was found to be quite as effective as Bordeaux in disease control, but, like the home-made cuprous oxide, resulted in higher yields. However, owing to packing difficulties this spray has gone off the local market.

Copper oxychloride, however, is now available and makes quite an efficient spray. In the New South Wales trial it was not quite equal to Bordeaux 4-4-40 in the control of target spot, but the increased yield from the plants treated with copper oxychloride more than compensates for this. The Queensland trials gave no information on disease control but also demonstrated the increased yield. In the three experiments from which information is available the increase over Bordeaux 4-4-40 was 12, 27 and 30 per cent.

Basic copper sulphate was available prior to the war, but at the moment has not yet reappeared on the local market. Experimental evidence on this compound is hardly sufficient as yet. What there is, coupled with observations made on growers' crops where this material has been used, indicates that it should be in much the same class as the oxychloride.

A basic copper carbonate spray used in the very early trials did not give satisfactory results. The main reason for this was that it had not been specially prepared for spray purposes and would not maintain its suspension in water, resulting in a very uneven coverage of the tomato bush and poor control of target spot.

In general it can be accepted that these insoluble copper compounds make a satisfactory spray, providing they have been prepared for that

purpose. The grower can readily check this by mixing some of the material with a little water. Obvious settling of the spray material and clearing of the liquid above in two or three minutes indicates that the material is unsuitable.

The Burgundy type of spray was used in only one trial. Disease control was good, equal to that of Bordeaux, but the effect on the plant was too severe at the strength equivalent to 4-4-40 Bordeaux. Experiments on the use of weaker strengths may increase the usefulness of these mixtures.

Copper Dust Mixtures.

There are two types of copper dust mixtures on the Queensland market. They are copper sulphate (dehydrated) with hydrated lime as the neutraliser and filler, and basic copper carbonate with kaolin or similar material as a filler.

General observations suggest that both these dusts will give an adequate control of Irish blight under normal conditions, but experiments indicate that they are inferior to the sprays in the control of target spot. This is illustrated by the results from an experiment when the average loss of fruit due to target spot from the plants treated with three different sprays was 11 per cent. while the average loss from plants treated with two different dusts was 23 per cent.

Comparing one dust with the other the copper sulphate-hydrated lime mixtures gave slightly better figures for control of target spot than the copper carbonate-kaolin, but in no one experiment was it definite. The latter dust, however, is less injurious to the plant, and as a result plants treated with copper carbonate mixture gave yields up to 20 per cent. greater than from those treated with copper sulphate mixtures.

A copper oxychloride dust was included in the 1944 trial, but disease incidence was insufficient to estimate its efficiency. The effect on the plant was of the same order as the copper carbonate dust.

On these results copper carbonate dusts are recommended. It should be mentioned here that it is uncommon to use straight copper carbonate-kaolin dusts, as the wide occurrence of tomato mite justifies the inclusion of a percentage of sulphur at all times. Consequently commercial dusts almost invariably contain sulphur, and lead arsenate is added when required for tomato grub control.

Relative Costs.

In estimating the cost of treating a tomato crop with fungicides there are two aspects to be considered, first the cost of the materials and second the cost of labour for application.

The cheapest way to purchase materials for a copper fungicide is in the form of copper sulphate crystals (bluestone) and hydrated lime. With these materials it costs approximately 1s. 9d. to make up 40 gallons of Bordeaux 4-4-40 mixture. To obtain the same amount of copper in a ready-mixed dust, the dearest form in which it can be purchased costs approximately 6s. The cost of a dust thus appears relatively high, but to offset this approximately 20 man hours must be allowed to spray an acre of full-grown tomato plants (using knapsacks), while it only takes approximately 8-10 man hours to dust the same area. In estimating

rates of working it is obvious to most growers that there is a considerable variation between individual workers, so the above figures were based on the working figures of six recognised tomato growers and the writer's own times for application of the different treatments. From the above figures it can be seen that if the labourer's time is worth 2s. or more per hour, then dusting is cheaper. It must be emphasised here, however, that, in the case of tomatoes, efficiency in disease control and effect on total yield of the crop are usually more important considerations than the original costs of the material and its application.

Plant Injury.

The plant injury discussed here is not of the type usually associated by the grower with damage by sprays. Very often the average observer would not notice any differences between the treatments, though sometimes the more extreme cases show a slight tendency towards a leaf curl and the plants, after several weeks, may be slightly stunted.

As a result of experiments in the United States of America it was found that there were three likely reasons for the stunting of plants by a fungicide. These may be simply stated as follows:—(i.) The spray is too acid or too alkaline; (ii.) an excess of lime is injurious in itself; (iii.) the damage is increased with the increase in the total amount of chemicals applied to the plant.

Bordeaux mixture is an offender under all three headings as compared to home-made cuprous oxide and the insoluble copper compounds. The Burgundy type of spray is in the same class as Bordeaux.

When comparing copper carbonate dust with copper sulphate dust, however, it is found that the total amount of chemicals used is the same, but the sulphate dust contains an excess of hydrated lime and is thus also very alkaline. From these considerations it appears that the lime is the chief factor in reducing total yields of fruit. Thus, wherever possible, this material should be avoided in making up dust mixtures.

An interesting lead for future work arises from the New South Wales trial. Bordeaux mixtures of the strength 1-1-40 and 2-2-40 were used in comparison with Bordeaux 4-4-40 and copper oxychloride sprays, and were found to give no more injury to the plants than the oxychloride and still be slightly more efficient than the latter in controlling target spot. No definite recommendations can be made for the present, but future experiments will probably consider this aspect of the work.

Conclusions.

The following recommendations are made:—

(i.) If the grower anticipates a heavy infection of target spot, then a wet spray should be used.

(ii.) If a wet spray is to be used and the grower desires to mix his own, then home-made cuprous oxide is recommended.

(iii.) If requiring a commercial spray, then the copper oxychloride product is the best of those available at present.

(iv.) If the grower decides that a dust is required, then copper carbonate-kaolin mixtures are recommended.

Water Blister Disease of Pineapples.

T. McKNIGHT, Assistant Pathologist.

MANY pineapple growers this season have suffered severe losses as a result of water blister disease occurring in their southern consignments.

An inspection of a number of representative farms has led to the obvious conclusion that many growers do not yet grasp the fact that infection of fruit with the water blister fungus occurs on their own plantations mainly from spores originating from nearby dumps of infective material and from the floor of the packing shed. Where growers have had considerable water blister losses, inspection of their packing sheds has shown that neglect or carelessness in the disposal of discarded tops, leaves, fruit, knobs and other trimmings has been responsible for the infection of the fruit.

This year, in February and March, the relatively high temperatures coinciding with more than usually abundant moisture have enabled the water blister fungus to enter and rapidly rot this discarded material, and at the same time form countless numbers of spores on the surface. These spores are carried in the air and germinate, like seeds of higher plants, after gaining entrance to the fruit through abrasions and bruises on the sides and shoulders of the fruit or through the stem end and occasionally through the broken top.

Provided fruit receive careful handling during picking and packing operations, it is only necessary to see that no infective material is left lying in or around the packing shed to ensure that wastage from water blister is reduced to very small proportions, if not entirely eliminated.

Growers who have had water blister in this year's consignments are therefore urged to dispose of dumps of discarded pineapple material by burying or burning and to spray their contaminated sheds thoroughly with a 5 per cent. solution of formalin. It may be noted that packing sheds with dirt floors are not as easy to keep clean and are more difficult and costly to sterilize than those with wooden or concrete floors. From then on growers must adopt a routine for the disposal of discarded tops and other material and maintain a high standard of hygiene in and around the packing shed.

This strict, but simple, maintenance of hygiene associated with careful handling of fruit and the rejection of cracked, sun-burned, "weeping" and "knobby" fruit are the measures adopted by careful growers who rarely receive a report of water blister disease in their southern consignments.

A Water-cooling Tower for Milk and Cream Cooling on the Dairy Farm.

F. G. FEW, Division of Dairying.

A RAPID deterioration in the quality of milk or cream produced on the farm soon follows unless means are available for the immediate cooling of the product while milking operations are in progress. The farmer's problem is, in fact, twofold. Firstly, there is the initial cooling while the herd is being milked, and secondly, the holding of the cans at a desirable temperature while awaiting transport from the farm.

On a farm supplying whole milk ideal results are unattainable under average Queensland conditions without the use of refrigeration, as the necessary temperatures to ensure no deterioration in quality are below those which can be produced by purely natural means. Similarly, for the holding of cans of milk, refrigeration is alone perfectly satisfactory.

In the case of cream, the temperature necessary to ensure satisfaction may be higher, and 70 deg. F. allows a desirable degree of ripening to occur in a cleanly produced product for butter-making by Australian manufacturing methods.

The holding period of cream on a farm is often considerable, and a satisfactory method of doing this was described in detail in the May, 1945, issue of this Journal. As mentioned in that article, the initial cooling of the cream immediately after separation is a necessary and additional requirement. The cost of a refrigeration unit for the ideal cooling and holding of whole milk on a farm is, unfortunately, too high to allow of its general introduction. The milk supplied may be either for the whole milk trade or for cheese manufacture. In the former case, the holding period is definitely limited, and the main problem in this instance is the immediate cooling of the milk to as low a temperature as can be obtained by methods other than refrigeration. For cheese manufacture, the holding period in the case of the morning's milk is likewise definitely limited, but the evening's milk may be held for 12 hours or so before despatch to the factory. Generally, however, night temperatures are below that to which the milk can be cooled by natural means, and so no improvement could be expected by the use of a charcoal cool cabinet, such as previously recommended for cream stored during the hours of the day.

The problem as far as milk-producing farms are concerned is thus to cool the milk during milking operations to as low a temperature as is possible by the use of natural and readily available means. Similarly, the remaining problem for cream suppliers is to quickly cool the cream to about 70 deg. F. and then place the cans in a charcoal cooler when the cans are to be stored during the day time.

In the absence of any naturally occurring cold water supply, the principles of evaporative cooling can often be utilised to very good effect. Quite a useful degree of cooling may be expected in most dairying areas, apart from those on the immediate coastal strip. As explained in the article on charcoal coolers, the existing wet-bulb temperature is the limiting factor in the degree of cooling possible by natural evaporative means. This is the lowest temperature to which water could be cooled on the farm without the use of refrigeration. While its value varies considerably, both from day to day and throughout any particular day, it does not exceed 70 deg. F. over quite a proportion of the dairying areas of this State. The natural cooling of water by self-evaporation to this temperature is thus quite practicable in these areas and, while entirely suitable for cream cooling and storage, this temperature also represents a valuable degree of cooling for freshly drawn milk, especially if transported to the factory within a short time.

The following particulars supplied by courtesy of the Meteorological Bureau show the average wet-bulb temperatures at the stated hours, and also the months when the average reading exceeds 70 deg. F. The blanks indicate that no regular readings are recorded at the given hours:—

Place.	Average Wet-Bulb Temperature for January.		Months when the Average Wet-Bulb Temperature is 70°F. or Over.	
	At 9 a.m.	At 3 p.m.	At 9 a.m.	At 3 p.m.
	°F.	°F.		
Atherton	69·4	..	None	..
Brisbane	70·9	71·8	January and February	December, January, and February
Bundaberg	72·6	73·5	December to March (inclusive)	November to March (inclusive)
Cairns	76·7	78·5	October to April (inclusive)	September to March (inclusive)
Dalby	67·9	69·9	None	None
Gayndah	71·4	73·0	December, January, and February	November to March (inclusive)
Gatton College	71·6	..	January and February	..
Gympie	72·1	..	December to February (inclusive)	..
Herberton	68·0	..	None	..
Ipswich	70·9	..	January and February	..
Miles	69·8	..	None	..
Mitchell	67·4	68·8	None	None
Pittsworth	65·8	..	None	..
Rockhampton	73·2	74·9	November to March (inclusive)	November to March (inclusive)
Toowoomba	65·7	..	None	..
Townsville	75·8	76·9	October to April (inclusive)	October to April (inclusive)
Warwick	65·9	..	None	..
Westwood	72·3	..	December to March (inclusive)	..

At all places the averages for January are the highest for any month of the year, the values during the cooler months of the year being, of course, considerably lower. The tables show that irrespective of the ordinary shade temperatures, water can be cooled by evaporation alone to the values given in the table, even during the hottest month of the year.

Areas on the immediate coastal strip are obviously not so suited for evaporative cooling, as the figures for Brisbane, Bundaberg, Cairns and Rockhampton show. The Darling Downs is admirably suited, the wet-bulb temperatures at Dalby, Miles, Mitchell, Pittsworth, Toowoomba and Warwick being never on the average equal to 70 deg. F., even under summer conditions. Figures for the North and South Burnett areas are not available, with the exception of Gayndah, and the values given are not likely to be exceeded at the other dairying centres in these districts.

With milk at a temperature around 95 deg. F. in the vat, it is thus quite practicable to cool it by at least 20 deg. F. to 25 deg. F. if water is available at the existing wet-bulb temperature, even during the hottest month of the year. Quite a number of different methods have been tried with the object of cooling water to the lowest temperature possible, the most satisfactory being recirculation over a tower, when all relevant facts are carefully considered. This is not a new method and most farmers will be familiar with the technique, which is exemplified by the cooling of recirculated vacreator water at butter factories, and is often used for cooling engine jacket water at factories or local power houses.

Tower Experimental Work.

Experimental work has been carried on for some time in the Beaudesert district, this area being selected initially for several reasons. It is convenient to allow of regular tests being made, and is an area where milk production for the whole milk trade is increasing. Most important, however, is the fact that the area is in an intermediate position between the relatively humid coastal strip and the dryer atmosphere of the Darling Downs. Unfortunately, wet-bulb temperatures are not regularly recorded at Beaudesert, but values taken each month during the experimental work show that values similar to those at Ipswich and Gatton College could on the average be expected. During the hottest months occasional values up to 75 deg. F. have been recorded, but these are exceptional and the average values would be more like those indicated. Any tower which would give satisfaction in the Beaudesert area is thus likely to be at least as successful elsewhere, and the design submitted with this article is expected to be applicable in any area of the State. It must be mentioned, however, that further tests are considered advisable, especially in other representative dairying areas, and it is proposed to do this. All the indications are, however, that the design will prove satisfactory, and with this understanding the tower can be recommended to all dairy farmers with the object of cooling either cream or milk for the liquid milk trade or for cheese manufacture. The volume of cream to be cooled is relatively so small that the tower is ample for all requirements and no further work is necessary in this direction.

A very much larger tower could be suggested and it would, undoubtedly, result in efficient cooling. From the viewpoint of economy, ease of construction, and availability of materials, it is, however, neces-

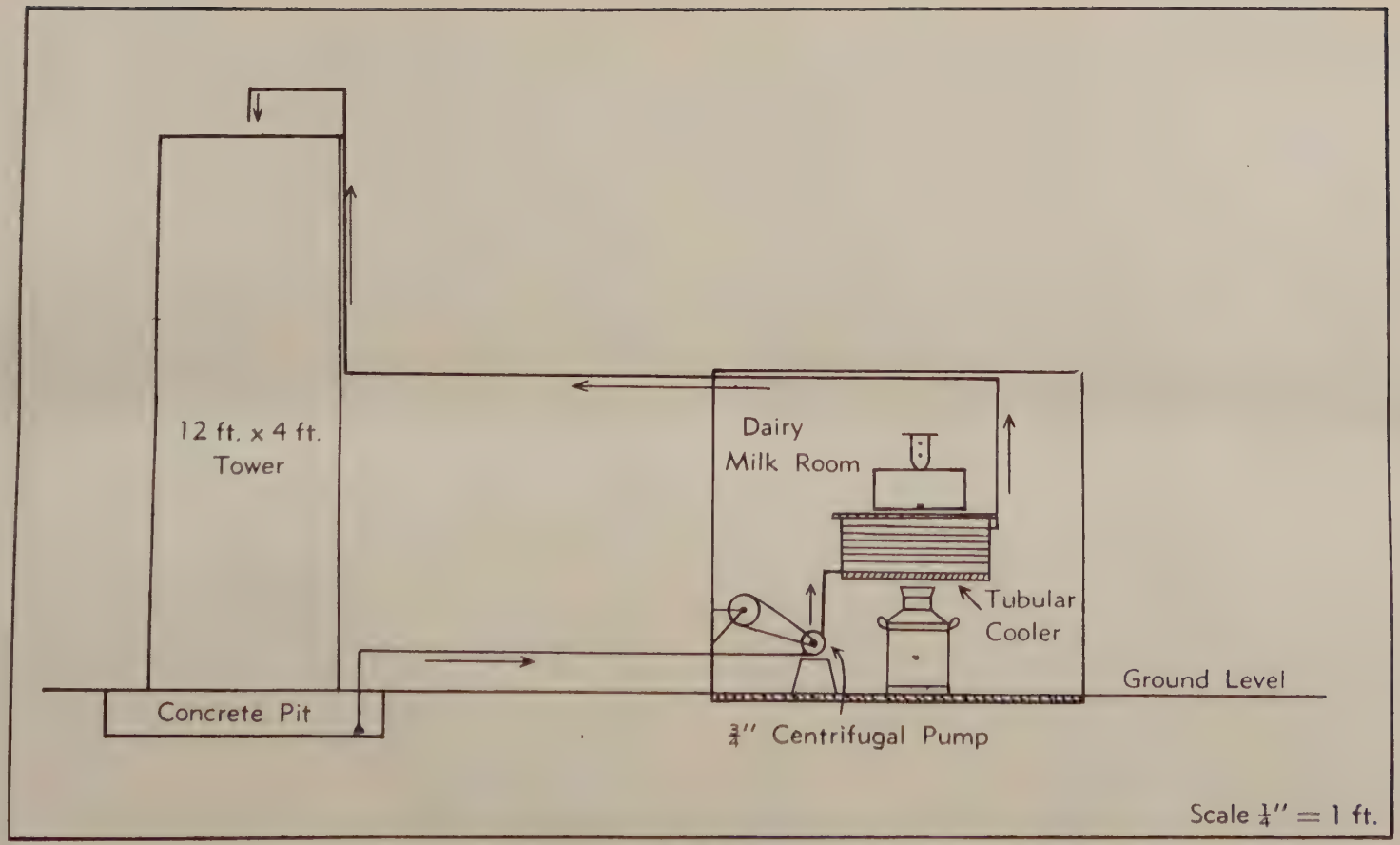


Plate 99.
SHOWING CIRCULATION SYSTEM USING A WATER-COOLING TOWER.

sary to use a tower no larger than actually required, the design submitted having an ample factor of safety to ensure satisfaction for all conditions conceivable after reviewing the experimental work so far carried out.

Description of Water Cooling System.

The accompanying diagram (Plate 99) shows the general arrangement of the tower-recirculated water cooling system. The water is drawn from the 1-ft. deep concrete pit below the tower by means of a $\frac{3}{4}$-in. centrifugal pump driven from the dairy house mainshaft as shown. The water is pumped through the tubular surface cooler and finally delivered for recooling at the top of the tower. A consideration of tubular water coolers was given in a previous article in this Journal, and they are the only type suitable for milk or cream cooling using tower-cooled recirculated water. The tower is placed away from the dairy building to ensure the proper ventilation essential for water-cooling. It should be located on the side of the building exposed to the prevailing winds during the summer months, but need not be far away provided free air access on its four sides is assured. The amount of water needed for recirculation is not large and the pit shown on the tower drawings will hold ample water (approximately 200 gallons). A deep pit is not advisable. Tests have shown that water leaving the tower is generally cooler than a large volume of water in a deep pit, and hence, on mixing, the water leaving for the cooler is higher in temperature than need be. Only sufficient water to properly cover the foot value is required. The other advantages of a shallow pit are ease of cleaning, safety where children are present, and a greater rate of circulation due to the much smaller suction lift unless (as is rarely the case) a deep pit is filled to the same water level. The cost of constructing a deep pit is also an item of importance, especially if made throughout of concrete, and results have shown that it is of no advantage from the viewpoint of efficient cooling.

Materials for Tower Construction.

All timber is of undressed hardwood and required concrete made of 4 : 2 : 1 mixture. The water distribution tray as shown is preferably of plain galvanised iron with 3-in. sides and perforated over its whole base area, although it can be made of boards (6 in. by $\frac{1}{2}$ in.) closely butted together and with $\frac{1}{2}$-in. holes bored along the centre of each board. The timber required is as follows:—

Tower Uprights: Four 3-in. by 3-in., 15 ft. long.

Louvres: Start 2 ft. from ground level and spaced 5 in. apart vertically; 25 are required for each side or 100 for the complete tower. They are of 6-in. by $\frac{1}{2}$-in. hardwood and are 3 ft. $4\frac{3}{4}$ in. in length. Each louvre extends across the 3-in. face of the holding 3 in. by $\frac{5}{8}$-in. batten strip resulting in a vertical overlap of $\frac{5}{8}$ in. and $1\frac{1}{2}$ in. measured along the louvre. Eight lengths of battening each 10 ft. long are required to hold the louvres.

Tower Bracing: Of 3-in by $\frac{5}{8}$-in. battening. Eight pieces each 7 ft. long are required.

Baffles: Made of 6-in. by $\frac{1}{2}$-in. hardwood. Five are required for each complete baffle, each board being 3 ft. 4 in. long. For the four sets of baffles twenty such boards are thus required.

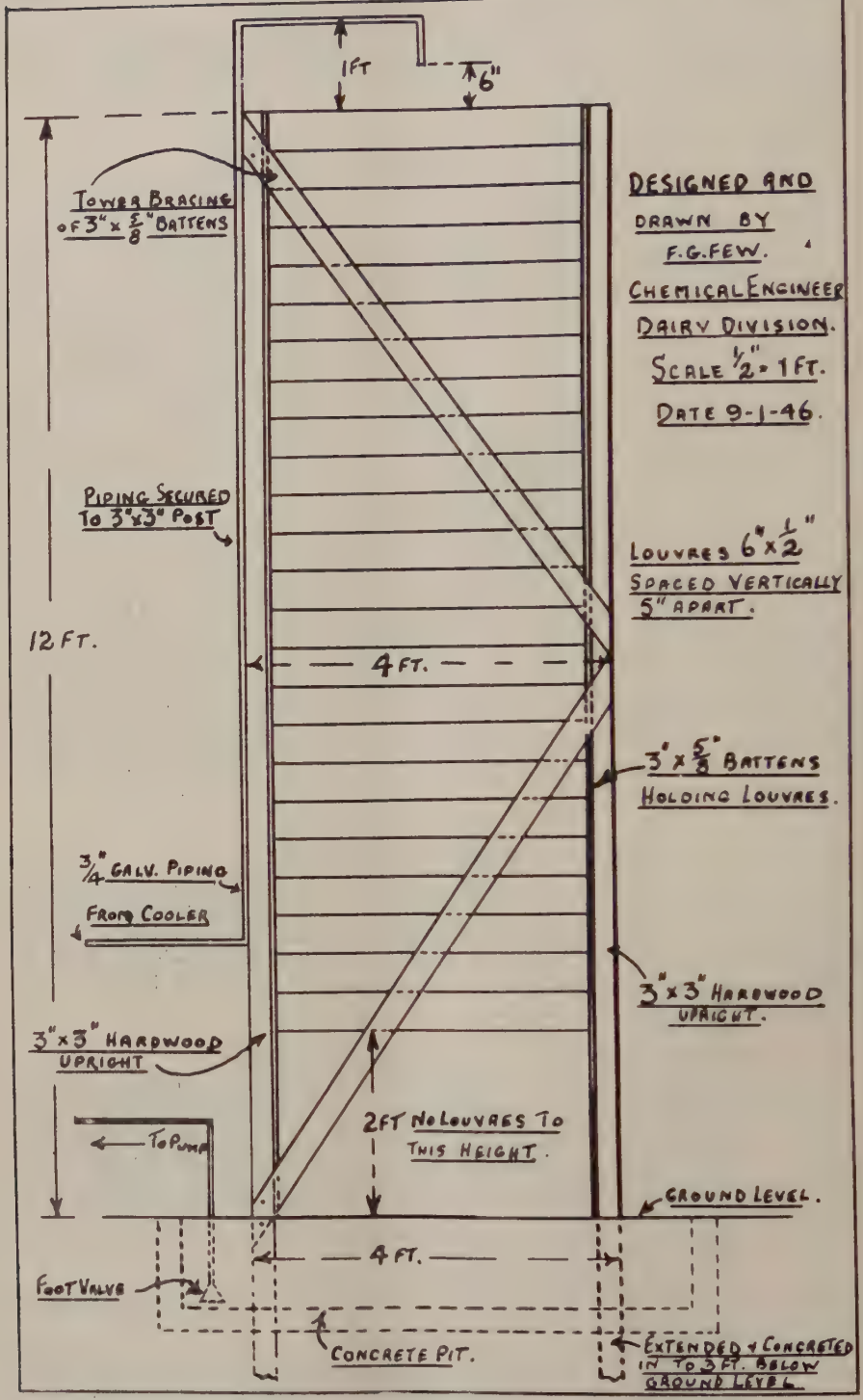


Plate 100.

ELEVATION OF 4-FT. SQUARE WATER-COOLING TOWER.

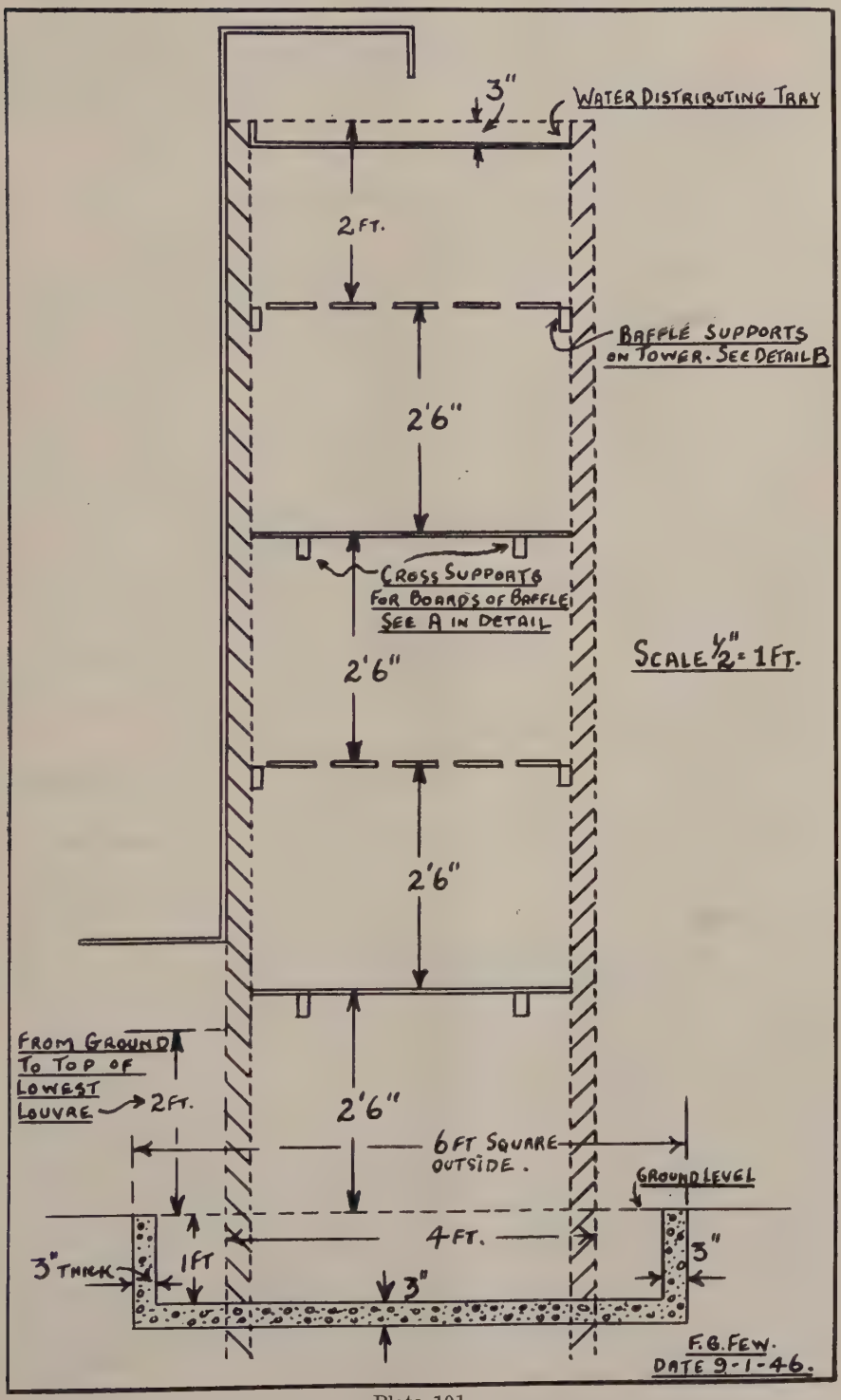


Plate 101.

SECTIONAL ELEVATION SHOWING NUMBER AND DISPOSITION OF BAFFLES AND CONCRETE PIT.

The baffle boards are nailed to cross supports, two of 3-in. by 1½-in. hardwood and 3 ft. 6 in. long being required for each complete baffle. Similarly these are flushed into the two 3-in. by 1½-in. supports, each 4 ft. long bolted to the tower uprights.

Summary of Materials Required.

Timber—

3-in. by 3-in. hardwood—four lengths of 15 ft. each.

6-in. by ½-in. hardwood—100 lengths of 3 ft. 4¾ in. each; 20 lengths of 3 ft. 4 in. each.

3-in. by 1½-in. hardwood—8 lengths of 3 ft. 6 in. each; 8 lengths of 4 ft. each.

3-in. by ⅝-in. hardwood—8 lengths of 10 ft. each; 8 lengths of 7 ft. each.

Concrete: Materials for approximately 20 cubic feet, allowing for concreting in of tower uprights. This requires about two-thirds of a yard of sand-gravel mixture and four bags of cement.

Piping: ¾-in. galvanised of a length determined by position of tower relative to dairy building. Clips to hold piping to tower also required.

Bolts and Nails: 16 bolts each ⅜ in. by 6 in. long. Nails—supply of 2 in.

Water Distributing Tray: Plain galvanised iron sheet 3 ft. 6 in. square with 3-in. sides soldered.

Circulating Pump: ¾-in. centrifugal pump, belt-driven from shaft in dairy.

Cooler: Standard tubular cooler either for milk or cream, as the case may be.

Construction of Tower.

The four tower uprights are erected on the chosen site after first excavating the necessary pit below the ground level. The posts are concreted in the ground up to the level of the bottom concrete of the pit—i.e., up to 1 ft. 3 in. from the ground level. The baffles and distributing tray are assembled and placed in position as shown on the drawings. Sections of battening from the 10-ft. lengths are cut to fit between the supports (B) bolted to the uprights and the appropriate number of louvres are fixed to the battens by nailing through from the outside of the battens into the louvres themselves. The assembled sections are then nailed to the tower uprights, the nails passing through the battens in the reverse direction to those holding the louvres. The tower bracing is then finally secured, and the piping, &c., arranged as required. Construction of the concrete pit is carried out, and any light iron or steel reinforcements available can be advantageously added when laying down. Similarly, a concrete path strip 2 ft. wide all round the tower prevents mud, &c., from easily entering the pit during wet weather or following excessive drift loss from the tower due to high winds. The path should slope away from the tower across its width to prevent water entering the pit during wet weather.

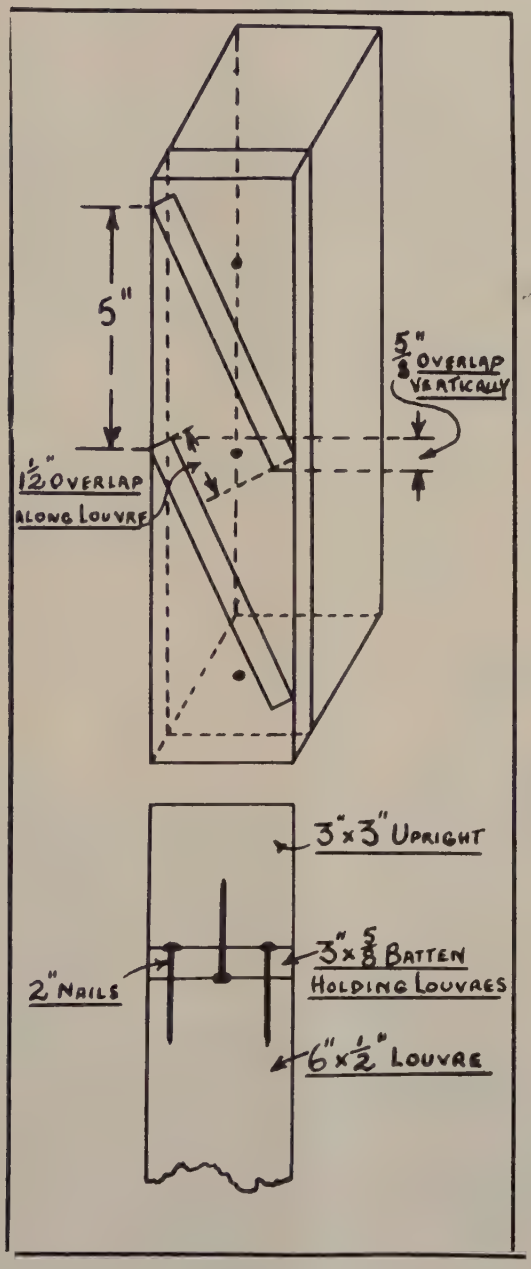


Plate 102.

DETAIL SHOWING METHOD OF NAILING LOUVRES TO BATTEN STRIPS AND ASSEMBLED SECTIONS TO TOWER UPRIGHTS.

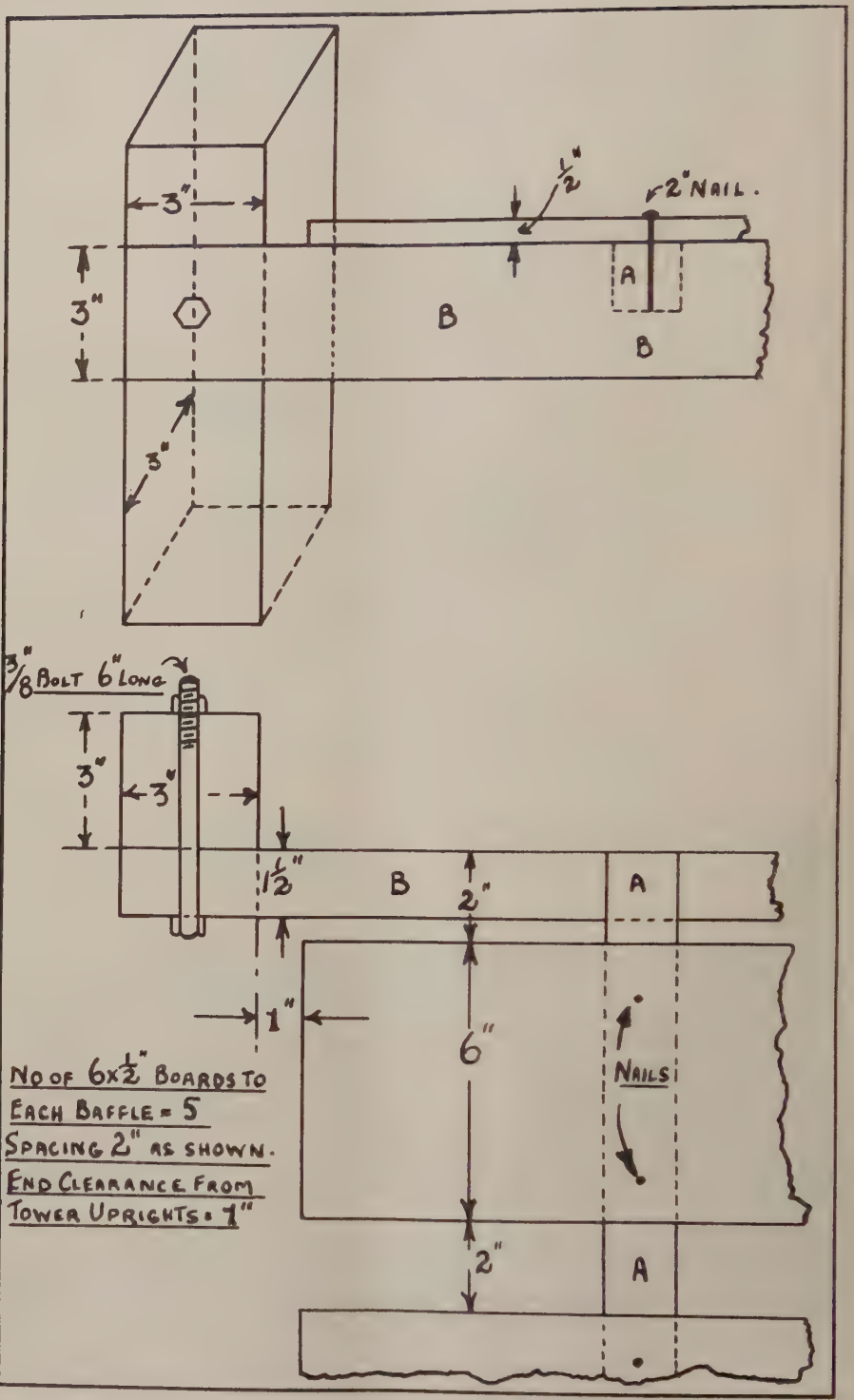


Plate 103.

SHOWING BAFFLE BOARDS NAILED TO CROSS SUPPORTS A AND SUPPORTS B FOR COMPLETED BAFFLES BOLTED TO TOWER UPRIGHTS.

Scale: 3" = 1 ft. F. G. FEW, 9-1-46.

Costs.

It is not possible to give exact costs due to the many variable and local factors involved. The cooler suitable for milk cooling (24 in. by 13 in.) costs about £8 10s., and a suitable pump and pulley about £6 complete. The timber, cement, &c., in a particular case cost around £5 10s., and approximately four days were required for the construction. The cost to the farmer doing the work himself is thus around £20, including cooler, pump, and driving pulley. In the case of most milk suppliers the pump and cooler are already on hand, and thus the additional cost, excluding labour, is merely that for the tower requirements. While a smaller pump would suffice for cooling cream, it is not considered that the cost of the pump is excessive, and it is likely to be of use in other ways, such as pumping water for tanks, household supplies, &c.

The practical cooling of cream or milk to an extent not possible otherwise is thus within easy reach of the farmer in most dairying districts throughout the State.

REFERENCES.

(1) Charcoal coolers on Dairy Farms—*Queensland Agricultural Journal*, Vol. 60, Part 5, May, 1945, p. 302-10.

(2) Milk Cooling on Darling Downs Farms—*Queensland Agricultural Journal*, Vol. 61, Part 4, October, 1945, p. 237-45.

Plate 104.
In the Coolabunia District, South Burnett.

Some Points in Herd Management.

C. R. TUMMON, Division of Dairying.

THE management of a dairy herd has an important bearing on milk production, and for this reason alone, greater attention could be given to this phase of dairying. Herd management commences from the time the calf is born.

Care of the Calf.

It may be assumed that only the best calves are kept—those from cows of proven production through herd testing, and sired by a well-bred bull. Once these calves have been selected, constant attention is required for the next six months or so of their lives until they are weaned, if they are to develop to the required standard. All setbacks in a calf's life should be avoided. Scours in calves probably produces the greatest setback. This is usually due to faulty feeding methods, and is often avoided by feeding a high proportion of fresh milk for the first few weeks, gradually reducing this milk and substituting skim milk. It is essential that the colostrum milk be fed for the first few days of the calf's life. Calf feeding buckets should be kept well cleaned and sterilised. In many districts calves suffer from worm infestation—principally stomach worms, but sometimes lung worms as well. Where any evidence of worm infestation is noticed (rough hair, pot belly, or bottle neck), regular drenching should be adopted and other precautions taken, such as changing calf paddocks, or liming paddocks to prevent re-infestation. During this period of calf feeding the calf should be handled as often as possible, and taught to hand-feed. There will then be little difficulty in breaking in the calf to the bails later on.

After weaning, calves should be kept in a suitable paddock with good feed and water and the necessary licks, and kept away from the bull until well grown, usually about eighteen months of age. Regular inspections should be made of these heifers, and when necessary, treatment for ticks, buffalo flies, &c., administered. A few days before these heifers are due to calve, they should be put in a paddock handy to the farmer's house, so that they may be observed, and any assistance can readily be given if difficult calving is experienced.

The heifers should be treated kindly when "breaking in" to bails. The calf should be taken away from her immediately she is brought into the yard. This is important, as the young cow will cease to fret about her calf, and will settle down more quickly. After calving, all cows should be douched in order to keep them clean.

Care of the Bull.

The bull must be kept in a separate "bull paddock." This practice is recommended in every way. It enables the farmer to regulate his calvings, according to the seasonal conditions, and it also conserves the bull's services. The bull is also less likely to get away and serve strange cows, possibly picking up infection.

All precautions should be taken to safeguard a herd against disease. An isolation paddock should be provided, and any animals noticed to be sick should be immediately segregated from the herd and placed there. Care should also be taken when introducing fresh cows from outside sources to see that they are healthy in every way.

Herd Testing.

Herd testing should be continuous. Even though the cows may all come from a good producing strain, it does not always follow that the progeny will be equally good.

Treatment of Cows at Milking.

Cows should be brought in to the milking yard with as little running about as possible. Dogging and the use of whips should be avoided. It has been found that these practices are responsible frequently for "holding up" of milk by cows. Cows are creatures of habit, and therefore it is a wise practice to accustom them to a routine. Milking should be done at the same time each day, and cows should always be milked in the same order. The udders should be washed immediately before milking. All these factors have a very important bearing on immediate "let-down" of milk. The milking should be done as quickly as possible, in order to secure the maximum amount of milk available in the udder. If milking machines are in use, care should be exercised to see that the teat cups do not stay on too long. If this happens, the teat cups gradually creep further up the teat, and some slight damage may be done to the delicate tissues of the udder, and this may possibly be a predisposing cause of mastitis. Non-stripping of dairy cows is recommended. This practice saves time, and it has now definitely been established that no harm is done to the cow, and the same amount of milk is obtained over a period, while there is no tendency for the cow to dry off. Where machines are used, the teat cups should be pulled down slightly when the cow has just milked out, and at the same time the udder should be gently grasped by the milker's hand, and rubbed down. This milks the cow out quite sufficiently.

When drying cows off, the old custom of gradually drying them off should be abandoned, and they should be turned out immediately, with no further milking taking place. This additional milking only serves to stimulate milk production.

It is suggested, therefore, that farmers should give every attention to this subject of herd management, and maximum production may be confidently expected where the foregoing suggestions are put into practice.

QUEENSLAND SHOW DATES.

Queensland Agricultural Show Societies are quickly moving again into active organization, and appended is a list of show dates, registered up to 10th January by the Queensland Chamber of Agricultural Societies, for 1946:—

MAY.

Gympie	22nd and 23rd
Biloela	23rd and 24th
Laidley	24th and 25th
Blackbutt	24th and 25th

JUNE.

Kalbar	1st
Boonah	7th and 8th
Childers	10th and 11th
Lowood	14th, 15th, and 17th
Gin Gin	17th and 18th
Rockhampton	19th to 22nd
Mackay	24th to 27th
Toogoolawah	28th and 29th

JULY.

Proserpine	5th and 6th
Rosewood	12th and 13th
Gatton	19th and 20th
Cairns	23rd, 24th, and 25th
Yarraman	26th and 27th
Ipswich	30th and 31st, and 1st and 2nd August

AUGUST.

Lawnton	2nd and 3rd
R.N.A.	12th to 17th

SEPTEMBER.

Canungra	7th
Beenleigh	20th and 21st

OCTOBER.

Nerang	4th and 5th

PRODUCTION RECORDING.

List of cows and heifers officially tested by Officers of the Department of Agriculture and Stock, which qualified for entry into the Advanced Register of the Herd Books of the A.I.S. and Jersey Societies. Production records for which have been compiled during the month of March, 1946 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORN.				
Mature Cow (Standard 350 Lb.).				
Rhodesview Kitty 16th	W. Gierke and Sons, Helidon	10,651·9	452·161	Fairvale Major
Junior, 4 Years (Standard 310 Lb.).				
Rhodesview Fanny 49th	W. Gierke and Sons, Helidon	7,789·1	348·737	Fairvale Major
Senior, 3 Years (Standard 290 Lb.).				
Glen Idol Florrie 7th	Estate P. Doherty, Gympie	8,928·85	364·976	Blacklands Count
Junior, 3 Years (Standard 270 Lb.).				
Wandegong Rosebud 2nd	H. G. Watson, Killarney	7,851·95	328·252	Alfa Vale Verdence
Glen Idol Daphne 11th	Estate P. Doherty, Gympie	7,770·6	314·624	Blacklands Count
Valera Sheila 11th	F. B. Sullivan, Pittsworth	8,451·55	295·758	Valera Daphne's Prince
Senior, 2 Years (Standard 250 Lb.).				
Sunnyview Polly 2nd	J. Phillips, Wondai	10,740·15	473·725	Sunnyview Kitchner
Ardilea Broady 10th	W. Hinrichsen, Clifton	8,818·75	354·523	Newstead Reliance
Valera Pearlie 2nd (233 days)	F. B. Sullivan, Pittsworth	7,247·5	283·463	Alfa Vale Pride 2nd
Junior, 2 Years (Standrad 230 Lb.).				
Valera Roseleaf 14th	F. B. Sullivan, Pittsworth	9,065·3	374·407	Alfa Vale Pride 2nd
Valera Lila 13th	F. B. Sullivan, Pittsworth	9,001·98	354·555	Alfa Vale Pride 2nd
Ardilea Broady 11th	W. Hinrichsen, Clifton	7,220·5	346·176	Newstead Reliance

JERSEY.

MATURE COW (STANDARD 350 LB.).

Kathleigh Mona	F. W. Kath, Dalby	10,415·75	536·726	Banyule Senor
Kathleigh Patience	F. W. Kath, Dalby	9,166·74	475·015	Retfords Kings Flier
Kathleigh Wattle	F. W. Kath, Dalby	8,261·06	471·634	Retfords Kings Thorn

SENIOR, 3 YEARS (STANDARD 390 LB.).

Boree Charming Girl	W. and C. Tudor, Branch Creek	7,194·95	368·202	Maurfield Larkspurs Gift
Glenview Mirth	W. Muller, Marburg	6,594·57	355·827	Trinity Governors Hope
Lermont Fan	J. Schull, Oakey	7,454·4	300·235	Lermont Ambassador

SENIOR, 2 YEARS (STANDARD 250 LB.).

Kathleigh Biddy	F. W. Kath, Dalby	7,059·68	395·632	Oxford Daffodils Victor
Tecoma Golden Darling	A. Semgreen, Coolabunia	5,985·25	356·163	Trinity Golden Royal
Navua Dreaming Victorine	F. Eager, Petrie	6,406·25	274·435	Navua Victorius Ruler

JUNIOR, 2 YEARS (STANDARD 230 LB.).

Kathleigh Maytime	F. W. Kath, Dalby	6,827·82	391·110	Oxford Daffodil Victor
Peeramon Glades	N. Harris, Ravenshoe	5,347·45	281·705	Peeramon Some Hope
Tecoma Golden Pet 2nd	A. Semgreen, Coolabunia	5,423·15	278·824	Trinity Golden Royal
Lermont Golden Pearl 2nd	G. Tilley, Beaudesert	5,398·55	257·085	Selseys Samares Hallmark
Romsey Rosina	J. Wilton, Killarney	4,512·0	241·580	Oxford Pixies Victor

Plate 105.
THE CONDAMINE AT LYNDHURST.

The Marketing of Pigs.

F. BOSTOCK, Officer in Charge, Pig Branch.

TYPE, condition and method of preparing pigs for sale should have the close attention of every farmer, because much money can be lost through carelessness in marketing.

Farmers who top the market gain a lot of satisfaction from the knowledge that their pigs are of the required type and have been marketed in the right way. While it may be impossible for all to obtain top price, that should certainly be every farmer's aim, but in any case satisfaction will be found in the consciousness of a job well done and in fair value received.

Good pigs marketed in the right way invariably attract good prices. On the other hand, poor-type animals, or those marketed in a dirty condition or showing other evidences of careless handling only sell well when supplies are below requirements.

Points in profitable pig marketing to be considered are:—

1. Pigs should be of right type to suit the market.
2. Proper feeding to ensure quick, healthy growth.
3. Plenty of "bloom" and clean skin, indicating proper housing.
4. Correct weight and condition.
5. Care in handling.
6. Careful branding in the proper place (just off the centre line of the body and on the shoulder with a right-sized brand).
7. Proper transportation so that the pigs are delivered in the sale pen clean and free from bruises.
8. Loading races should be free from faults in construction (the use of sticks, whips or the boot when loading should not be tolerated).

A pig of correct type is one which will measure up to market requirements and not necessarily of any particular breed. Good and bad type pigs may be in every breed. Therefore, farmers should give careful consideration to type when selecting breeding stock and not be satisfied with any class of animal. Good type baconers may be obtained from certain pure breeds, or by using two pure-bred animals of different breeds; or may be again improved by using sows of the first cross, mated back to a pure-bred boar.

The pig most in demand by the bacon trade and one which will realise the highest price per lb. is the long bodied, evenly proportioned animal with no excessive heaviness of head and shoulders, well filled hams, fine bone and reasonable depth of body to make a carcass of even and well-balanced conformation.

Unfortunately, the over-fat pig is still in evidence in our markets, and if farmers would pay more attention to the feeding of these pigs and control the amount of food according to the condition of the animal, together with providing ample grazing areas, they would receive more profitable returns. Apart from the financial loss, the loss through extra food consumed and wasted is considerable.

Pigs travel better on an empty stomach than on a full one and should not be fed just before despatch; if food is given, it should only be a small quantity of something solid, such as grain. Swill or bulky foods should never be given pigs just before sending them to market.

AN AUSTRALIAN FARMER WRITES A BOOK.

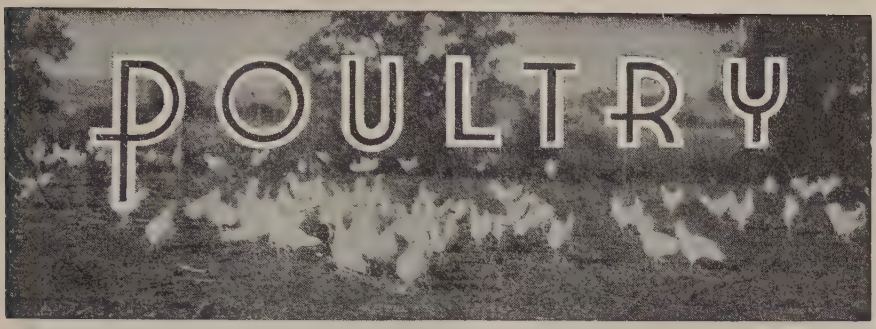
Not all are gifted with the power of literary expression, but here is a case of an Australian farmer who has made a great success of his farm, who loves his work and has found time to write a book about it. *Now Blame the Farmer* is the title, and the author is Hugh S. Robertson, who, incidentally, is an old A.I.F. Digger. His work has most of the qualities of a great book in full measure. His introduction contains the germ of his idea. He writes: "The primary purpose of this book is not to exonerate the farmer; it is an attempt to explain away the comparative failure of the general scheme of land utilisation. It is intended to expose the excesses and abuses that have led to the wanton destruction of the chemical and physical properties of the soil, and the tragic depopulation of the country."

In developing his idea, he pulls no punches and carries it through with a remarkable grasp of Australia's social history—the beginning of land settlement, pastoral development, the discovery of gold and the new land hunger which followed, the carrying over of the mentality of the miner, ruled by the hole-in-the-ground idea, without thought of the fact that the essence of good farming is intelligent cultivation of the soil and the maintenance of its fertility, as opposed to exploitation by a system of "mining" the soil instead of farming it—all these, including the entry of the financier into the field, are briefly yet fully and powerfully handled.

Much more could be said of this good Australian farmer's book, but space will only permit the summarising of a few essentials set out by its author. Here they are—

The adoption of an agriculture designed to restore and maintain fertility, and to confine farming to the strict limits of sound principles and sane practices. Men and women must come first. Whenever land settlement has been successful, it has succeeded because the terms and conditions of the settlement have given to men and women the opportunity of a good and useful life; wherever land settlement has failed, the failure has been due, not always to the quality of the land but more often to the quality of the life on the land. Farmers—Australian farmers, anyhow—must not be just peasants.

Another essential is the provision of adequate machinery for the change-over from bad land usage to good land usage, and to a high conception of country life. Still another essential is a complete system of stabilised price levels so that we may become commercially civilised in our approach to the primary industries. *Now Blame the Farmer* should be a welcome addition to any farmer's bookshelf.



The General Farm Poultry Flock.

A. W. McLAUCHLAN, Poultry Inspector.

UP to 100 head of poultry are kept by most farmers. The fowls are usually kept to supply domestic egg requirements, the surplus being sold through local channels, and also poultry for the table. The standard and quality of ordinary farm fowls are generally much below commercial poultry farm standards. All varieties of breeds are housed in all types of buildings. Of course, it is realised that one engaged in diversified production has not the time to give specialised attention to poultry as compared with the commercial poultry farmer.

In these days, hatching eggs, chickens, and stock are easily procurable, so there is no real reason why unprofitable birds should be kept. A good flock will thrive just as well as nondescript farm fowls.

A farm poultry flock may be founded on—

1. Fully grown fowls.
2. Started pullets 6 to 8 weeks old.
3. Day-old chickens.
4. Day-old pullet chickens.

Of these four foundations, the second should appeal to the general farmer, for at this age the chief worries of flock establishment are over. In buying such chickens, it is advisable to select them from registered hatcheries, so as to obtain disease-free stock as far as is possible.

Housing.

Proper housing for the stock should be provided. Failure to make a success of poultry farming is mainly due to lack of adequate accommodation. The buildings should be constructed in a workman-like way. Ample room and proper ventilation without draughts should be provided. There are three main systems of housing, viz.:—

1. Intensive, where birds are permanently housed.
2. Free range, where house is provided for sleeping under cover.
3. House and yard, where house is provided for sleeping and a netted run is attached.

The intensive system of housing has proved its economical value in the commercial poultry farming districts, as it ensures the greatest protection from the weather. The farmer can easily observe the health of his flock and check the spread of any disease which may occur.

Under the free range system which is most common in mixed farming areas, the birds are exposed to the weather, but the food bill is not so great as compared with fowls housed under the intensive system. The free range flock scratches for its own living to a large extent.

In the house and run system there is often the serious difficulty of soil contamination. However, this form of housing is sometimes seen in mixed farming areas, but usually the fowls are allowed free range during the afternoon. The site selected for the house should be on level, well-drained ground. The house should face north or north-east, and in all cases the floor should be cemented so as to control disease.

Culling.

Although housing conditions generally and feeding have much to do with profitable production, neither is so important as culling as a means of increasing and maintaining productivity. Hens should be culled after their second year of production, together with unfit birds. Presuming the conditions regarding food and housing are as they should be, even then the proportion of the birds in the flock which should be culled will be so high that it will be possible to appreciatively cut costs without interfering with the egg supply by simply grading them out.

Disease.

Prevention and control of disease is a problem facing every farmer. Disease in every case lowers the efficiency of production. Bad management, feeding, housing predisposes the flock to attack.

On mixed farms where a few birds are suffering from disease it is far more economical to kill and burn them than to apply treatment.

Sanitation is one of the chief controls of disease. Pens should be thoroughly cleaned regularly, drinking vessels should be kept clean and water changed regularly. New stock taken on to a farm should always be isolated for a time to avoid or reduce disease risks, and crates in which they were conveyed should be burnt, as parasites—such as the poultry tick or stickfast flea—may easily be introduced.

The most important poultry parasites are lice, mites, ticks, worms and, in some areas, the stickfast flea. By their increasing numbers and irritating effects these pests cause considerable discomfort to their hosts, with the result that the laying hens lose condition and egg production is reduced accordingly.

The poultry tick conceals itself in cracks and crevices of the house and perches during the day and attacks the birds at night. They may be found in all stages from the small six-legged larvae up to the adult tick with eight legs.

A knife or chisel thrust into the crevices of an infested shed will come out smeared with blood if ticks are present. Heavy losses have been recorded on poultry farms from fowl tick fever, which is caused by the tick being a carrier of the organism.

Ticks can be easily introduced on to a farm in infested crates and chicken boxes and by borrowing broody hens. The tick is very difficult to control, as its habit of hiding in cracks protects it from efficient spraying. Trees, pig pens, and similar places adjacent to fowlhouses have often been found to be infested. When badly infested, total destruction of the house is recommended. Creosote or kerosene emulsion make satisfactory sprays under pressure strong enough to force the spray into cracks, but this should be a regular practice. Perches should be painted also with crude oil.

Kerosene emulsion is made by boiling 1 lb. of soap in 1 gallon of rain water until dissolved. Remove the mixture from the fire and add 1 gallon of kerosene. Another 8 gallons (two kerosene tins full) of rain water is added before use.

Sawn timber used in the building of a fowlhouse is more easily treated for ticks than bush timber. The less timber used in the construction of the walls of the house the better, so as to minimise harbourage for ticks.

From the foregoing it may be gathered that profitable fowl keeping on a mixed farm requires much more than feeding a little grain and gathering in a few eggs; it requires well-bred stock properly housed and managed.

NO SYNTHETIC EQUAL TO NATURAL WOOL.

During the war, the Germans produced huge quantities of synthetic textiles from all sorts of material. They produced among other things artificial wool and artificial cotton. They also produced a so-called "spinning paper" as a substitute for hemp, jute, sisal, and other base fibres. Yet, after all, a leading German scientist has admitted that as yet there is no synthetic equal to natural wool or cotton, there is still no efficient substitute for wool despite all the claims made for synthetics in recent years.

Coming from such a source, this is a remarkable admission of especial interest to Australian woolgrowers. It is a statement contrary to Germany's pre-war claims that the production of synthetic fibres made her self-sufficient in respect of textile requirements. It is interesting now to know that those claims were not confirmed. In 1938, Germany imported more than a million bales of wool, and made strenuous efforts to obtain supplies during the war.

Since the war ended, buyers in most countries have shown by their keenness to obtain natural wool the anxiety of the peoples of those countries to obtain clothing made from the sheep's overcoat. Other woollen goods also are greatly needed by them, because on their wartime experience they cannot be beaten for comfort and long wear.

It is another interesting reflection that with all the much publicized qualities of synthetic materials, the chief use so far found for them is in stockings and a proportion of the women's dress goods trade. For those articles of clothing, synthetics have displaced silk, and, to an appreciable extent, cotton. The main appeal of these synthetics—nylon and the rest—is their appearance, sheen, and quick drying property after washing.

Although research workers are busy producing more of these attractive textiles, other research workers are busy with wool, and there seems no reason why they shouldn't succeed in producing stockings made from wool which will have all the attractiveness of the synthetic product and give greater foot comfort to the women who wear them. So there is still strength in the softgoods seller's slogan—"All wool and a yard wide." The "yard wide" in that slogan has, of course, no dimensional significance in regard to women's stockings!

Wool—natural wool off the sheep's back—can still hold the lead in textile manufacture, beating all competitors. All the same, we cannot afford to ignore the menace of competing fibres or let up in the drive for quality in pastures, flocks, and fleeces, for wool production is still the greatest of our land industries, and is still the highest factor in our national economy.

Plate 106.

CUTTING LUCERNE, KINGAROY DISTRICT.

Plate 107.

A SOUTH BURNETT FARM, CRAWFORD, MT. WOOROOLIN DISTRICT, NEAR KINGAROY.

ANIMAL HEALTH

Nodule Worm Disease of Sheep.

F. H. S. ROBERTS, Division of Animal Industry.

NODULE worm disease, or oesophagostomiasis, is a serious disease of sheep in many countries throughout the world. In Australia it is of most importance in those areas which receive the bulk of their rainfall in the summer months. The sheep raising areas of Queensland are all summer rainfall areas and the nodule worm has a distribution which extends well into our western country. However, it becomes serious only in those areas in receipt of an annual rainfall of about 20 inches and more. The Emerald-Clermont district and the Darling Downs know the depredations of this parasite only too well.

Description.

This parasite inhabits the large intestine of sheep, where it is found in greatest numbers in the region of the crown. It is a stout whitish worm, growing up to about ¾ of an inch in length, with the head bent somewhat like a hook. On opening up the bowel, the worms will be found lying adjacent to the bowel wall.

Life History.

Eggs laid by the female worm reach the ground in the pellets. Under summer conditions of warmth and moisture, a larval worm quickly develops inside the egg and within 24 hours the egg has hatched and the larva is set free. The larvae are now free-living in the soil and vegetation and gradually grow into a stage—the infective stage—when they are ready to infect the sheep. In warm moist weather this infective stage is reach in 6-7 days.

Where the grass is wet with dew or rain the larvae ascend the blades and are swallowed by the grazing sheep. They pass into the intestine and then bore into the intestinal wall, particularly that of the large bowel. The time spent in the intestinal wall varies considerably. In young sheep it is usually five to eight days, but may extend to three months, whilst in older sheep this period is usually longer, even up to six months. The young worms eventually make their way back into the bowel and here they stay for the remainder of their life. Eggs are laid two to three months after the larvae have been swallowed.

Nodule Worm Disease.

When the larva penetrates the wall of the bowel, the tissues react to the invasion and a nodule is formed around the larva. The nodule encloses a greenish cheesy material, in which the larva lies. As the nodule becomes older the contents harden and eventually become calcarous. In grown sheep which have been exposed to infection for some

time the nodules are conspicuous and may be found throughout the entire length of the small and large bowel, being more numerous in the latter. Such sheep, it is to be noted, are not usually infested with many adult worms. In young sheep, on the other hand, the nodules are usually small and insignificant and adult worms are present in large numbers. These nodules seriously interfere with normal bowel movement. This is one reason why sheep which have been exposed to heavy infection for most of their life fail to fatten. There are, however, more serious effects of infestation to be seen, principally in young sheep. The young worms, when breaking out of the nodules, produce ulcers and inflammation of the bowel wall. This condition is accompanied by a severe diarrhœa, with the passage of much mucous. Furthermore, the adult worms in the bowel are considered to excrete certain harmful substances which, on absorption by the sheep, cause serious ill effects.

Nodule worm disease is most harmful among breeding ewes and young sheep. Sheep pick up the larvae during the spring, summer and early autumn, but symptoms are not seen, as a rule, until the late autumn and winter, by which time the larvae have left the nodules and are lying in the bowel as adults. The poor state of the winter pastures is also a factor in outbreaks during this period of the year. A massive infestation may be rapidly fatal. The chronic type of the disease, however, is more common. Animals lose condition, and are affected with a diarrhœa containing much mucous, and sometimes blood. If such sheep are driven they run with a stiff awkward gait and show a characteristic tucked-up attitude. The skin and mucous membranes of the mouth and eyes may be pale, sometimes a doughy white. A marked break in the wool is not uncommon. Young sheep that survive remain stunted and unthrifty.

When making an examination of an animal suspected of suffering from nodule worm disease, one should give first consideration to the number of worms present. In young sheep 100 or more worms are regarded as being definitely harmful. When such infestations occur, the bowel wall in the vicinity of the worms will be found to be inflamed, thickened, and thrown into folds and covered with a thick, purulent, blood-streaked mucous, in which the worms lie. As indicated previously, the number of nodules to be seen is simply indicative of the period of exposure to infection and, in young sheep, they may not be at all conspicuous.

Treatment and Control.

Phenothiazine.

There is no drench of any value against the nodular form of the parasite. On the other hand, phenothiazine is highly efficient against those worms lying in the bowel. Phenothiazine is a greenish powder which is insoluble in water, but preparations are available whereby the phenothiazine can be suspended in water and thus be delivered to the sheep as a drench.

When preparing phenothiazine for drenching, it will be found a great advantage if the powder is first sieved to eliminate all lumps. A kitchen flour sifter is suitable for this purpose. There are various brands of phenothiazine on the market, and the directions for mixing given by each proprietor should be carefully followed. The final product should be a smooth, creamy mixture which can be delivered fairly readily in the drenching syringe specially manufactured for phenothiazine. These

syringes may tend to clog after some use, but this can be prevented by frequent washing in water and occasional oiling with liquid paraffin. After use, the springe should be thoroughly washed and oiled.

The dose rates are as follows:—

Grown sheep, 20 grammes;

Sheep 8—12 months, 15 grammes;

Sheep 4—8 months, 10 grammes.

Phenothiazine, being a dye, will unfortunately stain wool with which it comes into contact. This stain will not scour out. Part of the phenothiazine is rapidly absorbed by the sheep and is excreted in the urine, which is stained a reddish brown within an hour or two after drenching and may maintain its colour for four to five days. Urine containing phenothiazine will also stain wool. This staining can be prevented to a large extent if the following advice is considered:—

(*a*) After filling the syringe, dripping can be reduced by washing the nozzle in water. Water used for this purpose should be placed in a handy container and should be changed frequently. Another method is to attach, by means of rivets, a piece of thick sole rubber or leather (4 in. x 3 in. x 2 in. high) to the edge of the vessel containing the phenothiazine. Two or three V's are cut in this material and the nozzle of the syringe is drawn through one of these slots to remove any adhering suspension.

(*b*) A piece of cloth or sacking should be kept handy for wiping the hands.

(*c*) Sheep being drenched retain some of the phenothiazine on their mouths. This wiped against other sheep will stain. Provision should therefore be made that, as each sheep is drenched, it is immediately released from the race. The yard into which the drenched sheep are run should be large enough to prevent crowding. Finally, drenched sheep should be returned to their paddock as soon as possible to lessen contact with the phenothiazine passed in the urine.

Sheep are very tolerant to phenothiazine, much more so than other domestic animals. Reports, however, have been made that, when applied in late pregnancy, phenothiazine may cause abortion. For this reason it is advisable not to use this drug within a month of lambing.

When to Use Phenothiazine.—When the life history of the nodule worm is considered, it is found that adult worms do not appear in any numbers in the large bowel until during the autumn. Furthermore, during the winter the low temperatures and dry conditions are very unfavourable to eggs and larvae in the pastures, and during this period the number of larvae that gain access to the sheep is reduced to a minimum. In heavily infested areas, sheep, particularly the young sheep, should then be given their first treatment about April. As phenothiazine is also very effective against hair worms and the barber's pole worm, this treatment gives the sheep a better chance of thriving during the winter.

There will be, however, a number of larvae still within the nodules at the time of this treatment, and to catch these when they have moved into the bowel a second treatment will be required in June. A third

treatment is given in August. Treatment at this time is particularly advantageous in the case of breeding ewes, for by removing their worms they will not contaminate the pastures for their lambs.

Finally, it must not be forgotten that spelling pastures for one month or more results in a considerable destruction among worm eggs and larvae. Whenever sheep are treated at any other time than mid-winter they should be placed in such a spelled paddock, which could be used by horses whilst being spelled from sheep. This applies particularly to weaners.

Colics of the Horse.

K. M. GRANT, Government Veterinary Officer.

COLIC is the name given indiscriminately to most kinds of abdominal pain occurring in horses. Under this title, therefore, may be included most of the serious sicknesses of horses in Australia, as we are luckily free from most of the epidemic horse diseases of older countries, such as glanders and encephalomyelitis. Those most commonly encountered by the farmer are spasmodic colic, impaction colic and enteritis and these only will be considered in this article.

Causes.

Fundamentally, the basis of most attacks of colic are errors in management and feeding. Some horses seem especially predisposed to attacks, either by nature or disease, such as previous attacks, worm infestation and deficiencies in diet leading to the eating of sand and bark.

Throughout centuries of breeding and selection, the horse has been changed by man from an animal which spends most of its time grazing on bulky food to one which is trained to eat concentrated foods in a relatively quick time and then to work hard on a full stomach. These changes in feeding habits have not been accompanied by a corresponding change in the arrangement of the intestines, so that what might be otherwise a trifling digestive upset may have serious consequences in the horse.

Spasmodic Colic.

Simple spasmodic colic is usually caused by sudden chills or irritant food. Watering after feeding or cold water when overheated are frequent causes. Exposure to cold and wet, especially when the coat is long and rough, may bring on an attack. Fermentation of musty hay or spoiled grain is probably the most common source of the trouble.

Impaction Colic.

Impaction colic or obstipation is the most common form observed under Australian conditions. It is caused by the accumulation of faecal matter in the intestines leading to partial or complete blockage. Dry, stalky feed, such as poor hay, dry grazing, paddymelon vines or corn husks often cause trouble. The eating of sand, either as a mixture with chaff, in short grazing on sandy country, or in mineral-deficient animals (leading to a craving for abnormal food) is a frequent cause. Interference with the blood supply of the intestine by larval worms which

have caused blockages in the blood vessels may predispose the animal to repeated attacks. Sudden changes from concentrated to bulky food, such as at the end of the ploughing season, frequently cause obstipation.

It may also occur in old and debilitated animals because of weakness of the intestinal muscles, in spite of good feeding and management. Lack of attention to the teeth, by causing the swallowing of coarse, badly masticated food, frequently gives rise to the condition.

Enteritis.

The term enteritis may be used roughly to include a number of quickly fatal conditions of the intestines of the horse. It may sometimes be caused by infectious diseases, such as anthrax or haemorrhagic septicæmia, but is usually a complication arising from previous obstruction colic. Twisting of the intestine and gut-tie (telescoping of one piece of intestine into another, with subsequent rotting of the telescoped piece) may be conveniently grouped under this heading. An opening (usually caused by external violence) may exist unsuspected for a considerable time in the diaphragm or the caul without causing obvious symptoms until a loop of intestine is caught in it, leading to rapid death from enteritis.

Symptoms.

As the rational treatment of colic depends on its assignment to one of the groups described, it is very necessary to be able to recognise them. Rectal examination is one of the best clues in many cases, and the stock-owner who is interested in the subject may easily familiarize himself with the normal animal by repeated examinations. He is then in a position to appreciate any deviation from the normal. Examination is carried out by inserting a well lubricated hand and arm into the rectum. Parts of the large and small intestine may be recognised by feel through the wall of the rectum and in small horses it is possible to recognise the border of the left kidney. It can be readily determined whether the intestines are abnormally full of faecal matter or gas. In some cases twists and obstructions (calculi) may be felt. The condition of the mucous membrane of the rectum is also useful in forming a diagnosis. Provided reasonable care is observed the examination is without risk. The finger-nails should be cut short to avoid damage to the wall of the rectum and violent movements of the hand should be avoided. Service hobbles may be used to reduce risk to the operator. The left hand should be used to examine the right side and vice versa.

Spasmodic colic is sudden in its onset, with marked abdominal pain, kicking of the abdomen and periods of violent rolling. Between paroxysms the animal appears dull, but otherwise fairly normal. The eyes are bloodshot, but not staring. Attacks of pain usually last about 15 minutes and may come on every hour or so. Some scouring is usually noticed and the intestinal sounds (which may be heard by putting the head to the flank) are increased. These sounds frequently sound like water gurgling back and forth. The attack usually passes off in 12-24 hours without any complications.

Impaction colic is much slower in its onset than spasmodic colic, the horse being noticed dull for a day or so before any evidence of pain is shown. The eye is rather dirty and may be slightly yellow. Small amounts of dung may be passed for a time and then cease altogether. Intestinal sounds are absent or very weak. The recurrence of these during treatment is a favourable sign. Violent rolling is seldom noticed

but the animal appears more or less constantly in pain, pawing and looking repeatedly to the abdomen. When down he usually lies at full length and looks round frequently at the abdomen. The gait is stiff and jerky. On rectal examination the increase in the consistency of the intestines can be noted and the rectum itself is ballooned so that no difficulty is experienced in inserting the hand. Retention of the urine (so called "water gripes") is frequently noted. Relief of this condition may be necessary if the impaction persists more than 36 hours, but as it is due merely to pressure preventing the emptying of the bladder, it will be relieved automatically as the animal improves. It is this fact which has led farmers to place undue emphasis on the relief of this condition.

In sand impaction the sand may be seen by washing samples of dung. In cases where the small intestine is involved the onset of symptoms is more sudden and severe, but otherwise very similar symptoms are noted.

Cases recognised early and rationally treated usually respond but enteritis may develop with fatal results.

The onset of enteritis is sudden and severe from the start. Violent colicy pains, rolling, and switching are shown without intermission. The membranes of the eye are beef-red and the body temperature up to 105 F. Death may follow in about six hours. Animals strain frequently and pass small quantities of foul smelling dung. Although the body temperature is so high, the extremities and the ears are cold. The animal becomes bathed in sweat and shivers violently. The mucous membranes of the rectum are irritable and cling to the hand when it is inserted. Rubbing of the belly causes pain and is strongly resented by the patient.

Treatment.

As all kinds of colic may lead to serious complications, it is advisable to get competent veterinary advice as soon as possible, but failing this, home treatment is usually effective if intelligently applied. An intelligent diagnosis is essential and much harm may be done and much pain inflicted on the animal by the routine use of violent purgatives in all cases of colic.

In spasmodic colic 2 ounces of turpentine and 1½ pints (beerbottle full) of raw linseed oil is usually sufficient to bring speedy relief. Boiled linseed oil must NOT be used. One ounce of spirits of chloroform may be used to control the pain, but must be well diluted with oil or water.

Diet during and after recovery is most important and feeds should be light and easily digested, such as hay and small amounts of crushed oats. Bran mashes made by damping a half bucket of bran with *boiling* water and adding a tablespoonful of salt are useful. The mash should be allowed to steam with a bag over it for half an hour.

In impaction colic it is first necessary to soften the impacted mass with long enemas before any attempt is made to evacuate it. The use of violent purgatives before the mass is softened will do very little good and may lead to rupture of the weakened intestinal wall. A stirrup pump with the brass nozzle removed is the most convenient instrument to use. As these pumps are often used on farms for arsenical sprays, great care should be exercised to ensure that the hose is quite clean. If any doubt exists several buckets of water should be run through the pump first. The hose should be greased with vaseline or soap and first inserted only a few inches. As water is slowly pumped in, the rectum will balloon ahead of the tube and it may be introduced cautiously 3 to 4 feet. Large

quantities of warm, soapy water (up to 8 gallons) should be used and repeated as often as necessary. If the water is ejected soon after administration the enema should be repeated. Repeated enemas tend to soften the impacted mass and assist its gradual expulsion. The use of water introduced through the mouth by means of a stomach tube is very beneficial but this is best left to the expert. Leading the horse slowly improves the effect of the enema. The enema should be followed by a quick purgative such as 2 ounces of Barbadoes aloes dissolved in hot water, or liquid paraffin (3 pints). "Lentin" is used with much success, but due to the danger of rupture of the bowel, should only be used under direct veterinary supervision.

Plenty of water and small amounts of appetizing green feed should be provided. In sand colic this treatment may require repeating for several weeks.

The ordinary physic ball is too slow and uncertain in its effects to be reliable. Liquid paraffin may be repeated daily until the bowels are moving freely. Tonic balls of nux vomica and ammonium carbonate may then be given daily for a week until the healthy condition of the bowel is regained.

Home treatment of enteritis or of twist of the bowel is of very little use and all that can be done is to relieve the suffering for the time being with 1-2 ounces of chloral hydrate given either as a ball or in thin porridge, until skilled attention is available. Treatment of this group of conditions with violent purgatives is both barbarous and useless. Surgical intervention offers very little hope and is a very highly skilled procedure.

Treatment of valuable horses with sulphanilamide may be successful but is costly and quite useless where there is any organic lesion such as twist or strangulation of the intestine. An initial dose of 3 ounces of sulphanilamide should be given followed by 1½ ounces twice daily. This will only be effective in certain cases.

Prevention.

It is possible to prevent many cases of colic if reasonable care is exercised in the feeding and management of working horses.

It should be remembered that horses cannot rapidly adapt themselves to change and that any variation in feeding or working habits should be as gradual as possible. Most cases of colic occur either during ploughing and harvesting when horses are suddenly put on to concentrated feed and hard work or immediately after when they are turned out to rough grazing.

Where the feed is very dry a pint of dilute molasses or a few tablespoonsful of raw linseed oil should be poured over the feeds after they are prepared. Excess quantities of dry stalky fodder such as paddymelon vines or corn stalks should be avoided. Many attacks of colic have been caused by the feeding of mouldy or spoiled grain to horses although the same fodder has been fed to cattle and pigs without any untoward effects. Naturally horses should not be allowed to gorge themselves on any grain, especially wheat.

Horses should not be brought in hot out of the paddock and watered immediately but should be allowed, if possible, to cool down gradually. It is usually possible to see that they are not worked hard over the last quarter of an hour's ploughing and then by the time they are unyoked and slowly walked into the yards, they are sufficiently cool.

Bad teeth, leading to poor mastication, should be attended to promptly and worms eradicated by regular treatment of all the horses on the property, not only those showing symptoms of infection.

Although the monetary value of draught horses may not be very high at the present time, colic usually deprives the farmer of the use of his team at ploughing or harvest time when it is very difficult to replace a horse and considerable loss of valuable time is suffered. Attention to details of horse management at these times is amply repaid in a healthy and efficient team.

Warts in Cattle.

A. K. SUTHERLAND, Veterinary Officer, Animal Health Station, Yeerongpilly.

WARTS are the result of infection of the skin with an extremely minute organism, known as a virus. The infection causes an excessive growth of skin tissue, and can be responsible for financial loss. This loss is brought about—

(*a*) by loss of condition and stunting of seriously affected calves;

(*b*) by reduction in the value of hides;

(*c*) by reduced sale value, particularly of purebred stock.

Warts are common in calves and yearlings, and occasionally cows are affected on the udder and teats.

The disease is contagious, and infection probably occurs when small abrasions of the skin come in contact with warty animals or with fences, buildings, rubbing posts, or other structures which affected animals have touched. To prevent the disease it is therefore important that affected animals be isolated. This is best accomplished by moving the healthy calves to clean pens or paddocks.

Warts are most common on the head, neck, and shoulders. Other parts of the body are occasionally affected. The infections usually commence as small nodular growths, which later develop rapidly into horny cauliflower-like masses up to several inches in diameter. Some calves develop one or two small warts and are thereafter immune, whereas in other calves the growths enlarge and spread until perhaps most of the head and the neck are covered with large ugly growths. The latter is particularly likely to occur in calves which are overcrowded or suffering from malnutrition or worm infestation.

Treatment.

Calves with warts always eventually clear up even if no treatment is applied. However, this natural recovery may take a long time, so some treatment should be given to hasten it.

Many warts can be removed simply by clipping them off close to the skin with clean, sharp, curved scissors. The cut surface bleeds for a time, but this is of no consequence, unless the growths are very large. The stump should be treated with tincture of iodine, glacial acetic acid, or a caustic pencil.

This method of surgical removal cannot be applied when a large area of the calf's skin is involved. Nevertheless, a surprising number of warts can be cut off without any ill effects resulting. It has been stated that when a few large warts are cut off the development of immunity and the tendency to recovery are accelerated, but in view of the fact that, in time, the growths disappear without any treatment, it is difficult to verify this.

Another method of removing warts is to tie a ligature of linen thread or catgut tightly round the base of the wart and tighten it every day or so until the growth sloughs off. This method should be used for large growths.

A third method which has been used with some success is to paint the warts daily with castor oil.

If the calves are suffering from malnutrition or worm infestation, their chance of developing immunity and so recovering from warts will be increased if the feeding is improved and worm infestation is treated by drenching with phenothiazine.

Prevention.

It is important to remember that warts are contagious and that every wart contains virus which may infect another calf. Thus, if only a few calves are affected, they should be isolated and treated as described above. Prompt detection of cases and removal of warts will also limit the spread of infection.

As with most infectious diseases, some animals have a natural immunity, so that in some herds the spread of the disease may be limited. However, as it is impossible to know the extent of natural immunity in a herd until an outbreak has run its course, it is wise to adopt preventive measures.

A vaccine has been used for both the treatment and prevention of warts. Remembering the tendency for the disease to clear up spontaneously, the results obtained by subcutaneous injection of formolised vaccine have not been highly successful and the procedure cannot be recommended as an efficient preventive.

Agricultural Chemistry

Water for Livestock.

(Supplied by the Biochemistry Section.)

ORCHARDISTS and market gardeners have a rule of thumb for deciding if a saline water is unsuitable for irrigation—if it tastes brackish it is unsuitable.

There is no such rule in accessing the suitability of water for animals. Subterranean waters may have no brackish taste and yet be dangerous to stock, for example, through traces of fluorides. On the other hand, they may be quite distasteful to humans, through dissolved salts, and yet prove satisfactory for stock. The only reasonably sound method is to have the water analysed and an interpretation made by a competent person.

If temperature, turbidity, and pollution are excluded, then the main factors governing the suitability of water for stock are—

(1) Nature and amount of dissolved salts.

(2) Class and age of animal.

(3) Purpose for which used.

(4) Previous history of stock.

(5) Available foods.

An example from each of these groups will serve to illustrate the point.

(1) Beef cattle experience no disability if the drinking water contains 400 grains per gallon of common salt (sodium chloride) and only traces of other salts. Yet a similar level of magnesium or calcium chlorides (common constituents of saline waters) renders the water so distasteful that cattle have to be dying of thirst before they take even a swallow.

The amount of dissolved salt hardly calls for comment.

(2) The tolerance of sheep to highly saline waters is well known. In fact, sheep will thrive on water which is toxic to cattle. Young animals are unable to tolerate the degree of salinity which old animals take with impunity.

(3) While dairy cows will drink sufficient quantities of certain saline waters to meet normal body requirements, they frequently refuse to drink sufficient to meet the demands of full lactation and consequently milk production drops.

(4) Stock accustomed to fresh water frequently refuse saline water which locally bred stock take freely.

Travelling stock may suffer mortalities from a supply which local animals use regularly.

(5) Stock obtaining a reasonably high proportion of their moisture requirements from succulent feed will drink salt water which they ignore when only dry feed is available.

Hence the importance of having water analysed when there is any reason for suspecting its value should commend itself to all stock owners.

The service is free to producers. A clean 26-oz. bottle, rinsed twice with the water to be sampled, should be filled, securely stoppered and packed, and addressed to the Department of Agriculture and Stock, Brisbane, if posted, and to the Department of Agriculture and Stock, Roma street, if railed. The name and address of the owner should be on the parcel.

Information regarding the source of water, purpose for which to be used, and other relevant matters should be sent in an accompanying letter.

A VALUABLE CONTRIBUTION TO FORESTRY.

Review of "The Biology, Economic Importance and Control of The Pine Bark Weevil (Aesiotes notabilis Pasc.), by A. R. Brimblecombe, M.Sc."

This excellent paper was published in the "Queensland Journal of Agricultural Science," Vol. 2, No. 1, March, 1945, and reprints are available from the Queensland Forest Service.

The work is outstanding as a contribution to science from the purely technical point of view, but it is also extremely valuable from the point of view of forest management in Queensland and New South Wales. The programme of hoop pine planting in Queensland is more advanced than that in New South Wales, and the time is approaching when pruning must be commenced in the Southern State. Mr. Brimblecombe's work in Queensland will give us an advantage in combating the destructive pine bark weevil.

Mr. Brimblecombe has shown in his paper that pruning operations give the weevil an opportunity to attack plantation trees and the result is malformation and sometimes death of the trees. Detailed studies of the conditions favourable to attack led to his recommendation that pruning operations should be carried out only in dry, cold weather. In this way economic damage by the insect has been eliminated.

In a very brief review it is impossible to do justice to what is probably the most detailed study of a single Australian insect yet undertaken. The work includes data on ecology, meteorology, the form, life-cycle and habits of the weevil, with details of its natural enemies. It also outlines various methods of control, both chemical and silvicultural, attempted in the author's investigations.

Successful control of the pine bark weevil means a huge financial saving to both Queensland and New South Wales. It is capable of attacking introduced pines as well as hoop pine.

K. L. TAYLOR,
Forest Entomologist, Forestry Commission of New South Wales,
in *The Australian Timber Journal* for February.

GENERAL NOTES

Staff Changes and Appointments.

Mr. J. Shilkin, Veterinary Officer attached to the Veterinary Staff of the Department of Agriculture and Stock, Brisbane, who was engaged on milk investigation for the Department and the Brisbane Milk Board, has tendered his resignation.

The resignation of Mr. W. B. Horneman, Dairy Adviser, Department of Agriculture and Stock, Kingaroy, has been accepted as tendered.

Open Season for Duck and Quail.

Following the decision of the Government to declare an open season for duck and quail in Queensland this year, an Order in Council has been issued to-day under *The Fauna Protection Act of* 1937 to make provision for an open season. The effect of this Order in Council is to fix the open season for duck and quail in Southern Queensland from 1st May, 1946, to 31st July, 1946, both inclusive, and in Central and Northern Queensland from 1st July, 1946, to 30th September, 1946, both inclusive.

The attention of shooters is drawn to an Order in Council which prescribes that twenty (20) duck and twenty-five (25) quail are the maximum numbers, respectively, which any one person may take during a period of twenty-four hours.

Cessation of Bran and Pollard Rationing.

The Minister for Agriculture and Stock (Mr. H. H. Collins, M.L.A.) has announced that an Order issued by the Minister for Commerce and Agriculture appeared in the Commonwealth Gazette of the 25th March, revoking restrictions of sales of bran and pollard. This in effect, said the Minister, means that the rationing of bran and pollard has now ceased as control no longer exists over these commodities. The issue of permits for bran and pollard will therefore be automatically discontinued.

Maturity Standard for Citrus Fruits.

The Minister for Agriculture and Stock (Mr. H. H. Collins) has announced an amendment of *The Fruit and Vegetable Grading and Packing Regulations* to provide a new maturity standard for citrus fruits. The new standard, which will be enforced forthwith, is similar to that specified in the *Commonwealth Export Regulations* and the *Fruit and Vegetable Regulations* of New South Wales, Victoria, and South Australia.

Under the *Fruit and Vegetables Acts*, the maturity standard for citrus fruits was based on acid content only, and it is thought desirable, in order to prevent the marketing of immature citrus fruits, that the maturity standard for these fruits should be based on flavour as well as on acidity.

It is also important that the method of determining the juice content of oranges and the number of fruits to be taken by inspectors for an analysis should be specified, as the juice content varies with the method of extraction and with the size of the sample.

Peanut Board.

An Order in Council has been issued under the *Primary Producers' Organisation and Marketing Acts* giving notice of intention to extend the operations of the Peanut Board for a further period from 28th August, 1947, to 27th August, 1958.

Growers who are engaged in the production of peanuts and have supplied their product to the Board may, on or before the 13th May, 1946, lodge a petition with the Department of Agriculture and Stock for a poll on the question of whether or not the operations of the Peanut Board should be extended as above.

Rural Topics

Facts About Pigs.

Two facts of especial interest to beginners in pig raising are the remarkable capacity of a pig for utilizing its food to advantage, and that pigs mature earlier than any other domestic animal. Pigs gain 1 lb. live weight for every 5 lb. meal eaten; sheep 1 lb. live weight for every 8 lb. meal; and cattle 1 lb. live weight for every 10-15 lb. meal.

The figure of 5 lb. meal given for the pig is, of course, an outside figure. Pigs can and frequently do, put on 1 lb. of live weight for 3½ lb. of food consumed, which emphasizes still more the comparative efficiency of the pig's digestive system.

The earlier maturity of the pig ensures a more rapid turnover on capital, with obvious benefit to the farmer. As an illustration Henry and Morrison are quoted:—The calf doubles its birth weight in 47 days, the lamb doubles its birth weight in 15 days, the pig doubles its birth weight in 10 days.

The average sow will produce 12-14 offspring yearly, as compared with one (perhaps two) by cattle and sheep.

A Breeze from the Briny.

In a recent issue of the *Dairy Farmer*, an English monthly devoted to the cause of better methods, better milk, and better marketing, is a breezy article well worth quoting. Written by a Navy man who (like so many others who go down to the sea in ships) has realised an ambition (born and cherished, no doubt, in the midnight watches on the ocean wave) to own a bit of land to live and work on when he had swallowed the anchor and had bidden good-bye to the rolling sea, the article couldn't be anything else but breezy. The writer, Commander Stephen King-Hall, has made a success of his little farm and (among other bright things) here are a few tit-bits:—

"There's a lot of money to be made out of farming in the right way (by those who are stupid enough to want a lot of money) without help from anyone and by intelligent, scientifically-trained men with a bit of capital and the right land who meet the market, and who realise that their best bet is a highly paid industrial population ready to pay a good price for home-grown fresh food, such as dairy produce and so forth. . . . Every intelligent farmer ought to run a substantial side line. . . . If you want State control in agriculture, squeal for subsidies; if you don't, keep your mouth shut and support your own organisation for orderly marketing.

"There's nothing more holy or uplifting in digging a hole in the ground and planting a potato in it than in stopping a hole in a tooth so as to eat the potato. So please spare us the 'mystic' approach to agriculture. Don't pose as a public benefactor and an applicant for public assistance at the same time."

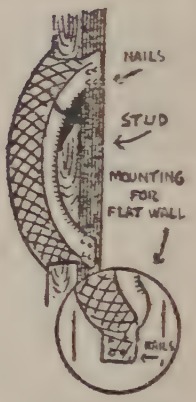
There is a lot more in this constructively critical strain, and all written with a cheery chuckle. The breezy old sea dog winds up with this: "And remember an exactly similar article could be written about any other calling. . . . The only job I know which is more or less immune from criticism is the job of the housewife, who is unpaid and shockingly equipped. The trouble is that at the present time we are sitting down complacently surveying our glorious past instead of working like 'billy-o' as a united nation to build up a glorious future. However, we shall learn by experience, but, it will be painful."

One side slant from this stimulating and provocative article is that if the farmer doesn't organise his own industry co-operatively and completely, some other crowd may do the organising for him, and that will be the end of the farmer's freedom.

GADGETS AND WRINKLES

A BUMPER BAR BUFFER.

To avoid jolts of the car in a garage mount two halves of an old car or truck tyre on the wall as shown in the diagram. The heavier the construction of the tyre the better.



TEETH TELL THE AGE OF CATTLE.

It is possible to tell the approximate age of cattle up to four years by their teeth as follows:—

All four temporary incisors on each side of lower jaw have erupted at birth or soon afterwards.

At 1 year 9 months the permanent central incisors erupt.

A 2 years 3 months the permanent lateral central incisors erupt.

At 2 years 9 months the permanent lateral incisors erupt.

At 3 years 3 months the permanent corner incisors erupt.

Although specific ages are given at which the teeth normally appear, variations from the normal are not infrequent. Thus, in station-bred or late-maturing cattle the teeth may be three months late in appearing, whereas in specially-bred cattle produced and prepared for show purposes the teeth may appear three months earlier than the ages stated. Three months normally elapse from eruption of the teeth until they are in full wear.

The eight temporary incisor teeth of cattle are present at birth or soon afterwards. At the same time the young calf is provided with three temporary molar teeth in each side of the jaw, above and below. These three molar teeth are described as 1st, 2nd, and 3rd molars.

In the course of time all of these temporary teeth are replaced by permanent teeth, and at the same time three additional molar teeth of a permanent type are added. These three are known as the 4th, 5th, and 6th molars.

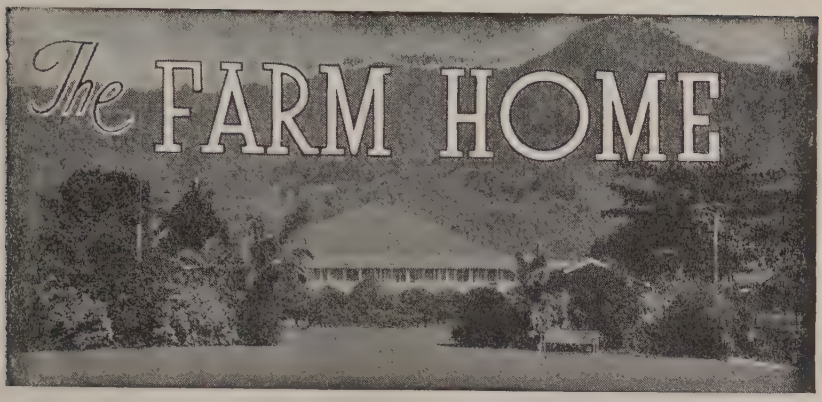
The 4th molar tooth, on each side of the jaw, appears as a permanent tooth at 6 months of age. The 5th molar tooth, also a permanent one, is cut at 15 months of age.

At 2 years of age the central incisor teeth have been replaced by two permanent teeth of a stronger and broader type. At this age the 6th molar tooth is also cut.

At 2½ years of age the next pair of incisor teeth are usually up, as well as the 1st and 2nd permanent molars.

At 3 years of age another pair of incisor teeth, known as laterals, are up, and usually in full wear, and the 3rd permanent molar is up.

At 3½ years of age the last pair of incisor teeth, known as corner broad teeth, are usually up and in full wear. These latter two teeth are more erratic than others in their time of appearance.—*New Zealand Journal of Agriculture.*



Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

THE FATHER'S SHARE IN THE CARE OF HIS CHILDREN.

ONE of our Queensland Child Welfare sisters, at present doing some demonstration work in Victoria, writes as follows:—"One morning I had an audience of about thirty big school boys who showed keen interest in the bathing and proper handling of baby. I showed them the easiest and most practical way of doing this. These future fathers may be glad some day that they had this little lesson in 'Mothercraft.'"

The captain of a big vessel does not actually steer his vessel himself, but because he is responsible for passengers and crew, he must see that it is properly done, and therefore he himself should know how it should be done.

Now that so many of our returned service men are re-establishing their homes, learning to "get along" with the small sons and daughters who have had so little share in daddy's life during the war years, it is practical to consider what should be the father's part in the care of his children.

Admittedly, the father is not at home sufficiently to see to the children's wants himself, but because he has a half-share in the responsibility for their health and well-being, it is part of his job to see that they are properly cared for. To do this, he should set out to learn what is involved in starting his little girls and boys out in life with sound minds in sound bodies.

What Father can do.

If a new baby is coming he can see that his wife gets the proper food and takes care of her own health. He can help her to see how important it is that early in her pregnancy she should attend the doctor who is to look after her confinement or an antenatal clinic. She must also go to the dentist. A father can help his wife a great deal at this time, carry heavy weights, fetch the wood or water, and take her a cup of tea in the morning if she is sick or very tired. He can avoid bringing his own worries and anxieties home more than is absolutely necessary, because the mother-to-be must be encouraged to have a bright and cheerful outlook.

After the baby is born, the father should see that it is fed by the mother herself. He should have read the books on the subject, and should know why the natural feeding of baby is so important.

He should refuse to allow a dummy to be given, because this spoils the shape of the child's mouth and dental arch and establishes a big risk of disease.

If the baby cries during the night, the father should not grumble and urge his wife to feed the baby, but rather by a few sympathetic words and timely help assure his wife that he is anxious for her to do as her doctor or sister at the welfare centre told her, and help her to find out why the baby is cross.

The father should take an interest in the baby's progress, see the baby's card after each visit to the welfare centre, and make it easy for his wife to attend the centre regularly.

The wise father does not say "I don't believe in it" when his wife tells him that she has been advised to have the child immunised, or his teeth treated, but will go and see the doctor himself and find out his reasons for giving such advice. He must know which foods are best for children, which are harmful, and why.

Early to bed is the best rule for children. The father can give them more time at week-ends if they are asleep in bed when he arrives home from work.

Good management and good example are most important in forming children's characters. Fathers are just as important as mothers in training the characters of their children. Fathers may study hard for the trade or profession which brings in the means of livelihood for the family, and should be prepared to study equally hard how to be good fathers. Advice about books on child management and help for fathers in their responsible task, together with any other information concerning child management, can be obtained by communicating personally with the *Maternal and Child Welfare Information Bureau*, 184 *St. Paul's Terrace, Brisbane*, or by addressing letters, "*Baby Clinic, Brisbane*." These letters need not be stamped.

IN THE FARM KITCHEN.

Savory Cabbage.

Remove the butt of the cabbage and wash each leaf under running water, scrubbing if necessary. Gather the leaves together again and cut them in shreds as you would a lettuce. Put a lump of butter—about an ounce for a small cabbage—in a saucepan. Put in the cabbage. Add pepper and ½-cup hot water and salt; then add four or five bacon bones or a small ham bone. Bury them slightly under the cabbage. Cover the pan tightly and bring to the boil. Shake the pan and lower the temperature. Allow to steam very gently, shaking the pan now and then for about twenty-five or thirty minutes, till the cabbage is soft enough. Do not raise the lid more than necessary, so allowing the steam to escape. When cooked remove the bones and chop the cabbage through several times. There should be no water to drain off.

Savory cabbage served with fried sausages makes a delicious dish.

Horseradish Sauce.

1 cup stock
1 tablespoon flour
Grated horseradish
Salt and pepper

Moisten the flour with a little cold water, and add the thickening to the hot stock. Cook the mixture until it is smooth and clear. Season with salt and pepper. Just before serving it add as much horseradish as desired.

Carrot Jam.

Ingredients.—Four or five carrots (large), seven large lemons, eight cups cold water, 4 lb. sugar.

Method.—Wash and dry the lemons, cut in halves and squeeze juice out. Soak the halves in slightly salted water overnight. Next day boil lemon skins in fresh water until soft. Remove all the white, and cut the skin into fine strips. Wash, scrape and grate carrots and soak in half the water overnight. Add remainder of water, lemon rind, boil gently until tender—about 1 hour. Add heated sugar and lemon juice and boil quickly until it is well set—three-quarters to one hour.

Scrap Fritters.

One pint frying batter made with wholemeal flour, 3 tablespoons cold cooked vegetables or meat scraps or fish left-overs, according to what larder contains. Cut up into small pieces, add to batter, stir, and fry as fritters. If there should be left-overs of fruit, these can be used instead and the fritters made into a sweet instead of a savoury dish.

QUEENSLAND WEATHER IN APRIL.

Queensland, generally speaking, experienced an exceptionally dry month, average district rainfall totals being the lowest April recordings since April, 1938, except in the southern coastal belt of the South Coast Moreton Division and parts of the Darling Downs West and Maranoa Divisions where over average aggregate totals occurred. The better rainfall distribution in these areas was due to the heavy to local flood rain accompanying a cyclone centred off-shore during the first week. Stations in the Western, Central, South-west and Carpentaria Divisions, with very few exceptions, reported no rain, and following on the dry months of February and March, the dry April conditions have resulted in insufficient winter feed being assured for pastoral requirements, unless substantial early falls occur in May. Low rainfall totals in the North and Central Coast Divisions have resulted in young sugar crops suffering a set-back, and this season's yield will be decreased accordingly. The dry spell continues in the Port Curtis Division (68 per cent.) below normal, and in the Callide and Dawson Valleys relief is required for agricultural purposes.

Flooding.—The rainfall accompanying the offshore cyclonic depression from the 2nd to 5th caused moderate rises in the Mary and Stanley Rivers, where local flooding occurred. At Murrumba, where the Brisbane River rose to 15 feet, 3 feet over the traffic bridge, on 6th, conditions are indicative of the temporary traffic dislocation which occurred in these areas. Some heavy falls 3rd/4th included a few 8 to 12 inch amounts—Springbrook 1,290, Bald Knob 881, Cooroy 806. The run-off from moderate rains in the Darling Downs and Maranoa Divisions resulted in light freshes in all streams in those areas, the Balonne at St. George and Surat rising to 8 feet 6 inches, 6 inches above the reporting height of 8 feet.

Pressure.—At the end of March another cyclonic centre was operating over Ocean Areas between Willis Island and the New Hebrides. This centre gradually moved south-west accompanied by rough south-easterly weather on the coast south from Mackay till the 5th. On the 1st, the centre below 29.7 inches was approximately 200/250 miles south-east from Willis Island, and by 9 a.m. Wednesday it was 200 miles north-east from Rockhampton, moving south-west to south. On the 4th, the centre below 29.5 inches was located 80/100 miles east from Maryborough, fortunately moving south to south-east to the north Tasman Sea by 9 a.m. on the 5th. This centre brought the heavy to local flood rains in the Moreton district 3rd/4th. As far as Queensland was concerned, a fine weather period then accompanied that extensive continental anticyclonic control which dominated the synoptic situation until 21st. On that date, a closed depression below 29.7 inches developed in the Great Australian Bight and moved fairly rapidly eastwards to Central Victoria by 9 a.m. 23rd. The two "cold fronts" associated with this depression were insufficiently active in the Queensland region to affect weather conditions, except to cause local dust squalls in western districts and scattered showers and thunderstorms when they reached the south-east corner of the State during the 23rd/24th. The well-defined anticyclonic belt which followed this depression maintained fine weather except for isolated coastal showers until the 29th, when increasing activity along a "dip," which developed over western Queensland, began to cause rising dew points and unsettled weather in the south-west quarter and southern border districts.

Temperatures.—Maximum temperatures in the Central and Southern Interior and in the Subtropical coast areas were below normal, ranging from 0.3 deg. below at Longreach to 3.7 deg. below average at Thargomindah. On the tropical coast and in the Peninsula and Carpentaria Divisions maximum readings were above normal, varying from 1.1 above at Rockhampton to 2.4 deg. above at Georgetown. Minimum readings throughout the whole State were below normal, varying from 3.7 deg. below at Longreach to 6.4 deg. below at Georgetown. Temperatures of 100 deg. were reported from Burketown on three days, this being the only station to report century readings.

Frosts.—Except for mild conditions at the beginning of the month 1st/6th and from 19th/24th moderately sharp night temperatures were experienced with light to moderate local frosts chiefly on the Darling Downs. The lowest minimum readings reported were Bybera 9th (32 deg./23 deg.), Stanthorpe 9th (30 deg./20 deg.), and Toowoomba 28th (40 deg./30 deg.).

Brisbane.—Pressure 9 + 3 29.951 inches (normal 30.041 inches), lowest since 29.942 inches in 1938. Mean barometer reading at 1,510 (4th) 29.663 inches (lowest since 29.486 on 2/4/1931). Temperatures—mean maximum 78.5 deg. (normal 78.9 deg.), mean minimum 59.9 deg. (normal 61.4 deg.), mean temperature 69.2 deg. (normal 70.2 deg.), highest daily 84.6 deg. (6th), lowest daily 53.0 deg. (29th). Rainfall—411 points (6 days), average 366 points (12 days). Highest daily fall 281 points on 4th, highest since 546 points 5/4/1933. Highest wind gust—47 miles per hour from East at 1210 hours (1st).

The rain position is summarised below—

Division.	Normal Mean.	Mean April, 1946.	Departure from Normal.
	Points.	Points.	Per cent.
Peninsula North	659	173	72 below
Peninsula South	164	29	82 ,,
Lower Carpentaria	101	Nil	100 ,,
Upper Carpentaria	115	Nil	100 ,,
North Coast, Barron	788	96	88 ,,
North Coast, Herbert	822	69	92 ,,
Central Coast, East	288	11	96 ,,
Central Coast, West	145	Nil	100 ,,
Central Highlands	150	5	97 ,,
Central Lowlands	121	Nil	100 ,,
Upper Western	57	Nil	100 ,,
Lower Western	80	Nil	100 ,,
South Coast, Port Curtis	249	92	63 ,,
South Coast, Moreton	416	418	—
Darling Downs, East	161	131	19 ,,
Darling Downs, West	119	110	8 ,,
Maranoa	129	67	48 ,,
Warrego	110	1	99 ,,
Far South-West	86	Nil	100 ,,

Commonwealth of Australia,
Meteorological Bureau, Brisbane.

ASTRONOMICAL DATA FOR QUEENSLAND.

JUNE.

Supplied by the Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Date.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	6.30	5.00	Cairns	7	50	Longreach	26	43
6	6.32	5.00	Charleville	25	29	Quilpie	37	33
11	6.34	4.59	Cloncurry	36	63	Rockhampton ..	1	19
16	6.36	5.00	Cunnamulla ..	32	27	Roma	15	19
21	6.38	5.00	Dirranbandi ..	22	16	Townsville	8	42
26	6.39	5.02	Emerald	11	28	Winton	29	52
30	6.39	5.03	Hughenden ..	21	49	Warwick	6	3

TIMES OF MOONRISE AND MOONSET.

At Brisbane.		
Date.	Rise.	Set.
	a.m.	p.m.
1	7.43	6.20
2	8.49	7·24
3	9 50	8.29
4	10·43	9.34
5	11.28	10.36
	p.m	
6	12.07	11.35
7	12.42	..
		a.m.
8	1.13	12.31
9	1.44	1.25
10	2.14	2.18
11	2.45	3.10
12	3.19	4.03
13	3.55	4.56
14	4.35	5.50
15	5.19	6.44
16	6.08	7.37
17	7·01	8.28
18	7.57	9.15
19	8.54	9.59
20	9.52	10.38
21	10.51	11.15
22	11.50	11.50
		p.m.
23	..	12.25
	a.m.	
24	12.51	1.01
25	1.54	1.38
26	2.59	2.21
27	4.08	3.08
28	5.18	4.02
29	6.27	5.03
30	7.32	6.08

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville 27; Cunnamulla 29; Dirranbandi 19;
Quilpie 35; Roma 17; Warwick 4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Date.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	11	29	26	44	0	19	28	52
6	14	23	30	39	5	15	34	45
11	24	15	40	31	15	6	46	35
16	29	10	45	25	20	0	52	28
21	23	14	39	30	14	5	45	34
26	14	25	30	41	5	16	34	48
30	10	29	26	44	0	19	28	52

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Date.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	6	51	36	64	20	50	7	43
3	6	50	36	63	20	49	7	42
5	12	43	39	59	24	45	12	36
7	21	34	45	54	30	39	19	29
9	30	29	51	50	35	35	25	25
11	40	19	57	44	42	29	33	18
13	48	11	63	38	47	24	39	12
15	52	5	66	34	50	20	43	7
17	52	4	66	34	50	20	43	6
19	47	8	62	36	47	22	38	9
21	38	17	56	43	41	27	32	17
23	28	28	50	49	34	34	24	24
25	21	38	45	56	30	41	19	33
27	12	43	39	59	24	45	12	36
30	5	52	35	64	20	50	6	43

Phases of the Moon.—First Quarter, 7th June, 2.06 a.m.; Full Moon, 15th June, 4.42 a.m.; Last Quarter, 22nd June, 11.12 p.m.; New Moon, 29th June, 2.06 p.m.

On 22nd June at 11 a.m. the Sun will reach its maximum declination North and will rise and set about 25 degrees north of true east and true west respectively. On 8th June and 23rd the Moon will rise and set at approximate true east and true west respectively.

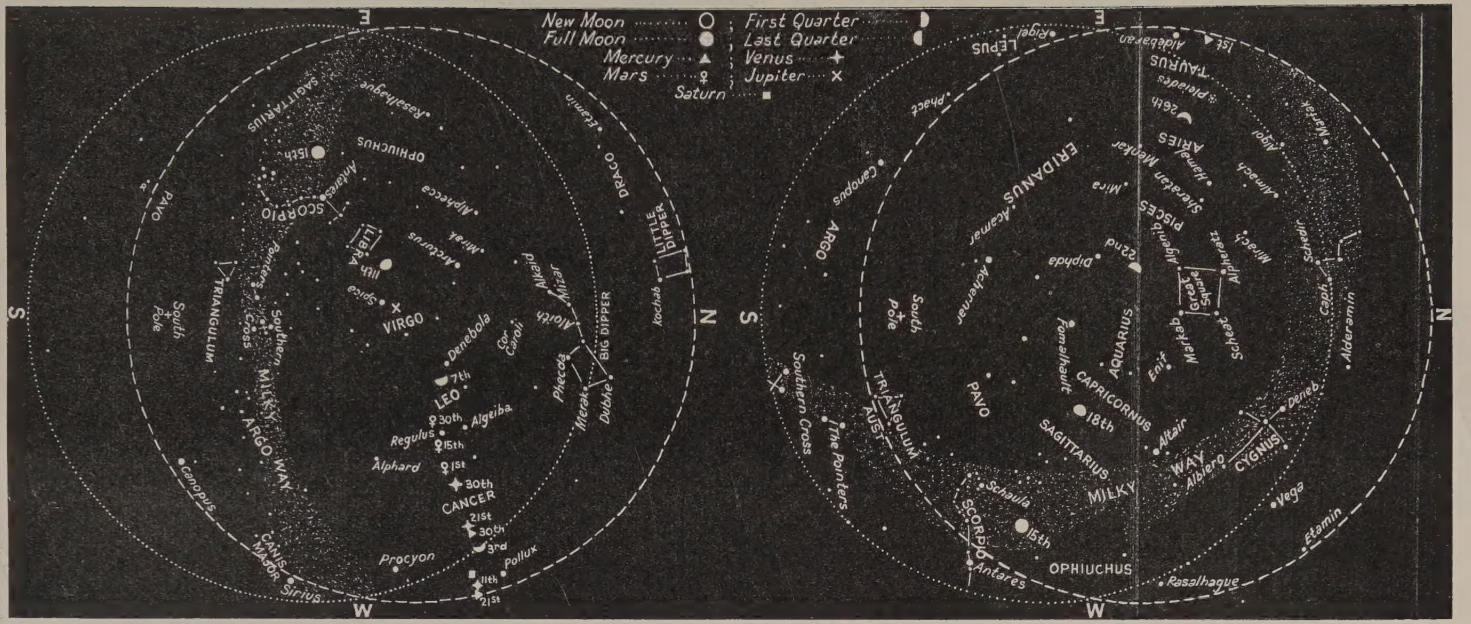
Mercury—At the beginning of the month will rise and set about the same time as the Sun while at the end of the month it will set about 2 hours after Sunset.

Venus.—Will set between 6.50 p.m. and 8 p.m. at the beginning of the month and between 7.45 p.m. and 8.45 p.m. at thet end of the month. On the 12th it will pass 2 degrees north of Saturn.

Mars.—At the beginning of the month will set between 10 p.m. and 11 p.m. and at the end of the month between 9.30 p.m. and 10.30 p.m. On the 18th it will pass less than one degree north of Regulus.

Jupiter.—Still a brilliant object, near Spica, in the evening sky. It will set between 2.30 a.m. and 3.30 a.m. at the beginning of the month and a little later than midnight at the end of the month.

Saturn.—Now beginning to pass out of the evening sky. It will set between 8 p.m. and 9 p.m. at the beginning of the month and between 6.15 p.m. and 7.30 p.m. at the end of the month.



Star Charts.—The chart on the left is for 7.15 p.m. in the south-east corner of Queensland to 9.15 p.m. along the Northern Territory border, on 15th April. (For every degree of Longitude we go west, Time increases 4 minutes). The chart on the right is for 10 hours later. On each chart the dashed circle is the horizon at Cape York and the dotted circle is the horizon along the New South Wales border. When facing North hold "N" at the bottom; when facing south hold "S" at the bottom, and similarly for the other directions. Only the brightest stars are included and the more conspicuous constellations named. The stars which do not change their relation to one another, moving east to west, arrive at any selected position about 4 minutes earlier each night. Thus, at the beginning of the month the stars will be in the positions shown, about 1 hour later than the time stated for the 15th and at the end of the month about 1 hour earlier than that time. The positions of the Moon and Planets, which are continually changing in relation to the stars, are shown for certain marked days. When no date is marked the position is for the middle of the month.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

APRIL RAINFALL.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Apr.	No. of years' records.	Apr., 1945.	Apr., 1946.		Apr.	No. of years' records.	Apr., 1945.	Apr., 1946.
North Coast.	In.		In.	In.	*South Coast—cont'd.*	In.		In.	In.
Atherton	4·42	42	6·74	2·20	Gatton College ..	1·86	44	1·29	..
Cairns	11·23	61	6·05	0·63	Gayndah	1·46	72	0·96	0·14
Cardwell	8·78	71	4·20	0·52	Gympie	3·43	73	1·67	4·21
Cooktown	8·69	67	4·31	1·77	Kilkivan	2·20	62	0·43	2·09
Herberton	3·73	57	2·81	0·49	Maryborough ..	3·81	72	1·95	2·50
Ingham	7·64	51	4·38	0·27	Nambour	6·13	47	6·39	6·92
Innisfail	20·21	62	15·73	2·64	Nanango	1·93	61	1·41	1·42
Mossman	7·41	19	4·63	0·88	Rockhampton ..	2·53	72	0·19	0·14
Townsville	3·29	72	1·60	0·03	Woodford	4·52	55	3·44	5·29
Central Coast.					*Darling Downs.*				
Ayr	2·77	56	1·35	0·10	Dalby	1·39	73	2·06	0·97
Bowen	2·91	72	0·70	0·19	Emu Vale	1·32	47	1·53	1·00
Charters Towers ..	1·54	61	0·96	Nil	Jimbour	1·42	64	1·91	0·60
Mackay	6·31	72	2·82	0·53	Miles	1·43	58	2·83	1·78
Proserpine	6·11	40	5·38	0·33	Stanthorpe	1·70	70	2·08	0·79
St. Lawrence ..	2·73	72	0·87	Nil	Toowoomba	2·56	71	3·61	1·19
					Warwick	1·60	78	2·11	1·22
South Coast.					*Maranoa.*				
Biggenden	2·15	44	0·99	0·58	Roma	1·28	69	3·10	0·25
Bundaberg	3·25	60	0·65	2·73	St. George	1·29	62	0·62	0·47
Brisbane Bureau ..	3·66	94	4·32	4·11					
Caboolture	4·48	67	3·52	4·48	*Central Highlands.*				
Childers	2·85	48	2·52	1·46	Clermont	1·64	72	Nil	Nil
Crohamhurst	6·68	50	6·83	8·78	Springsure	1·56	74	0·62	Nil
Esk	2·89	56	1·09	1·51					

CLIMATOLOGICAL TABLE FOR APRIL.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Atmospheric Pressure at 9 a.m. Mean	Shade Temperature.		Extremes of Shade Temperature.				Rainfall.	
		Mean Max.	Mean Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Pts.	
Cairns	..	86	68	92	6	57	19	84	6
Herberton	..	79	54	85	3, 4	44	15, 17	49	5
Townsville	..	87	65	95	5	55	26	3	1
Rockhampton	29·97	85	60	91	6	50	17	14	3
Brisbane	29·99	79	60	85	6	53	29	411	6
Darling Downs.									
Dalby	..	78	49	83	22, 23	40	9	97	4
Stanthorpe	..	70	42	76	5	30	9	79	8
Toowoomba	..	72	49	77	13	40	10	119	3
Mid-Interior.									
Georgetown	29·86	92	60	99	4	45	22, 23	Nil	
Longreach	30·04	88	57	95	3	48	24	Nil	
Mitchell	30·04	79	47	87	5, 22	36	10	2	1
Western.									
Burketown	..	94	64	100	3, 4, 5	55	19, 20	3	1
Boulia	29·99	85	56	96	30	48	21	Nil	
Thargomindah	30·05	79	54	91	4	41	27	Nil	

A. S. RICHARDS, Divisional Meteorologist.

Commonwealth of Australia,
Meteorological Bureau, Brisbane.